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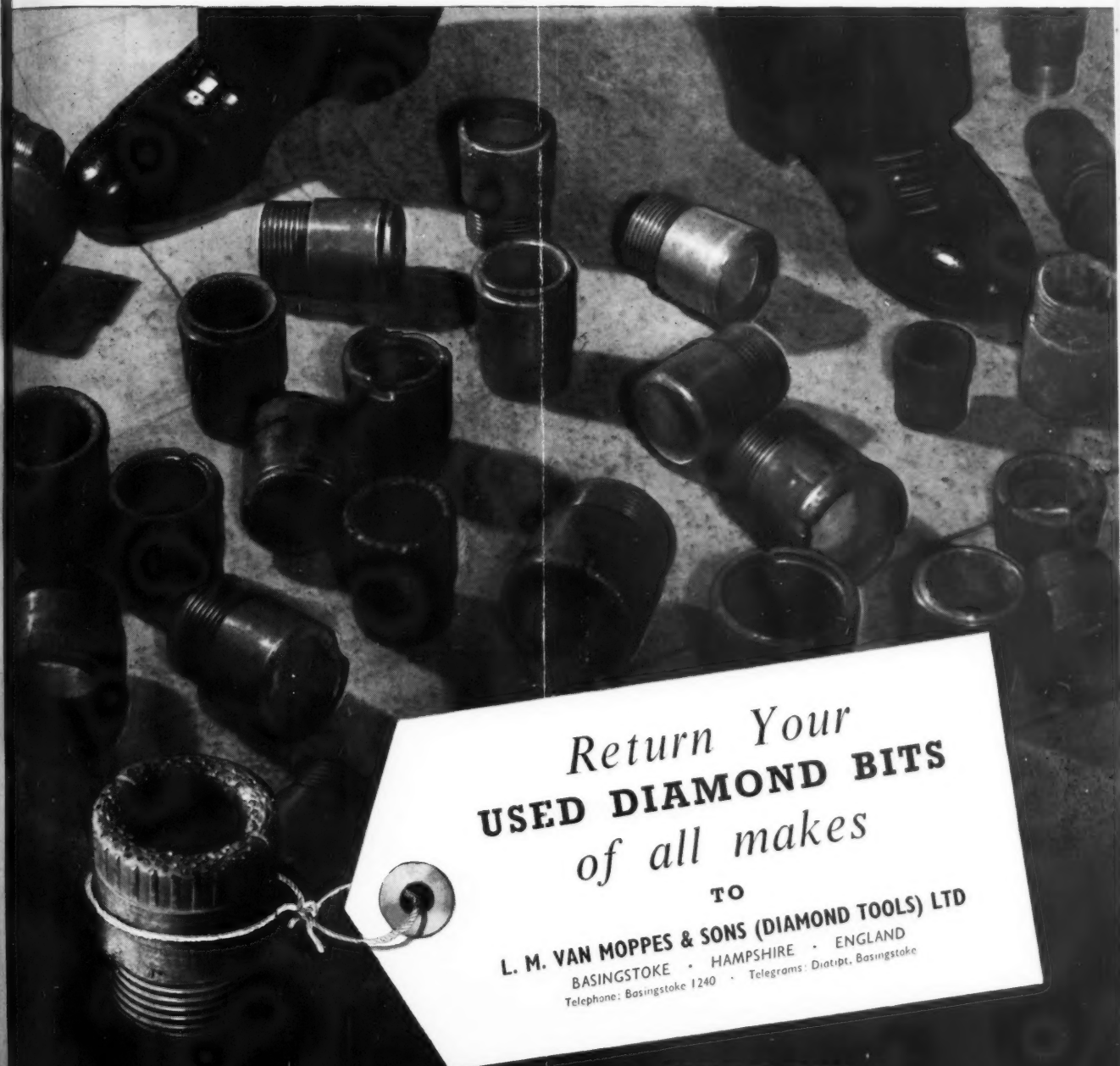
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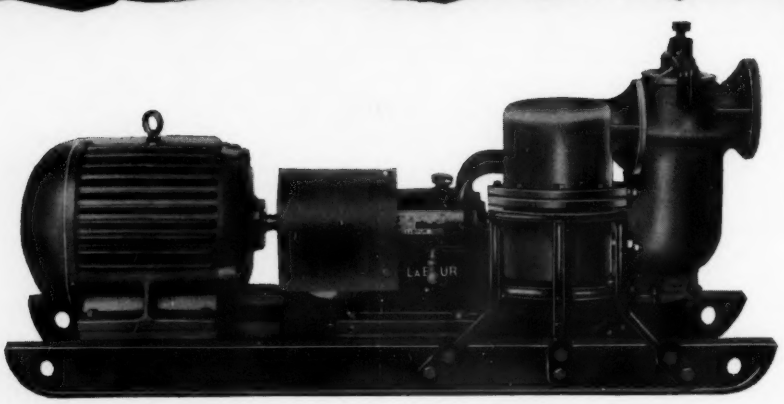

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The Mining Journal

London, May 1, 1959

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Coal in Transition?

TO those concerned with the West European coal industries, the clock must appear to have been put back 25 years; back to an era when the technical problems involved in winning the coal were subordinate to the economic problems involved in selling it. This state of affairs is in stark contrast to a European post-war coal mining policy dominated by a need for coal at any price, and where an apparent unsatiable demand for fuel permitted a drop in the accepted standards of mining.

Plans to increase coal output and estimated forecasts of production and consumption have been issued with bewildering frequency in Europe and, also to some extent, in the U.S.A. The latter country, however, has experienced several such sudden changes in supply and demand and the coal industry is attuned to such changes and is more capable of adjusting itself to conform to the prevailing pattern than is Britain or the Pool countries. A cause of worry in the U.S. is the impact that the European coal glut is having on their export market. Within the last two years, exports to Europe of American coal have dropped appreciably—from 81,000,000 tons in 1957 to 55,000,000 tons last year—and there is every indication that this downward plunge will continue. An additional source of worry is the fact that, far more than in Western Europe, the U.S. coal industry has had to compete with severe competition from oil and natural gas. So much so that in the last twelve years the contribution of bituminous coal to U.S. energy consumption in those fields where coal can be used, has declined by one-half and, currently, oil and gas now supply 60 per cent of the energy requirements in these markets. In consequence, production of bituminous coal last year fell by almost 100,000,000 tons to rather less than 400,000,000. If the situation is serious in the bituminous coal industry, that in the anthracite industry is even more so. The anthracite industry, formerly bolstered by the domestic heating market, is now at its lowest ebb since 1875, and there appears to be little prospect of material improvement. Abundant cheap natural gas is rapidly replacing anthracite and has made crippling encroachments into traditional markets.

Although the picture in Western Europe is bleak with over 45,000,000 tons unsold stocks, the blame for this position cannot be attributed wholly to competition from imported fuels. The use of oil is increasing, and will continue to do so, but at the moment the non-solid fossil fuels are only biting at the market and not devouring it. Competition from oil and gas is going to increase in severity. To meet this threat there are two distinct lines of attack.

Firstly, governmental discrimination against oil and gas, taking the form of crippling import duties. This is the easy way out and, not unnaturally, is the remedy prescribed by many of the trade unions. Conflicting, however, as it does with the declared national policy of the Western Governments, it seems unlikely that recourse will be made to legislation as a curb to alternatives to coal.

The second line of attack is much more fundamental to the problem, and although simple in conception is difficult in execution. Coal must be made competitive, and quickly. Now that demand has fallen off, at long last an opportunity for selective mining presents itself. Selective in two senses. Selective from the necessity of working only those mines which can reasonably be expected to show a profit, and selective in the choice of coal-getting machinery. A start has already been made, and the closing of high-cost pits is now recognized as an economic necessity.

Similarly, greater discrimination is being shown in the selection of power-loading machinery. A machine which gives a high output must now also give a saleable product. This fact has been obscured in the past by the urgency of the need for coal, and an assured market greedy for every ton wound. Already the rate of increase in mechanizing underground operations is slowing down and, apart from more stringent technical control of mechanization, it is going to be increasingly difficult to resist the miners' claim for more hand working in order to alleviate redundancy. Taken overall, these changes are bound to be reflected on the order books of the mining machinery manufacturers who must, accordingly, cast a wider net.

The burning question of the moment is, of course, this: are we, in fact, witnessing the start of a major change in the fuel pattern of the West, or is the current situation merely an inevitable manifestation of a temporary industrial recession?

There is no simple answer. Long-term forecasts of fuel demands are so wrapped up in "ifs" and "buts" as to be of limited value. To take just one example, it must be conceded that the long-term future of coal is inextricably bound up with that of nuclear energy and the contribution which this will make. Estimates of this contribution are given frequently; estimates which are increasingly optimistic. Again, competition from the non-solid fossil fuels must inevitably increase, but the international situation is so unstable as to militate against accurate forecasting.

On the bright side is the fact that there is a potential demand for fuel so vast as to enable coal to maintain a large share of the fuel market of the future. Time, at least, is on the side of coal, the reserves of which are far in excess of those of oil and gas. Despite the discovery of new oilfields many authorities estimate the virtual depletion of deposits early in the next century. Thus, at about the time that nuclear power is taking over from coal much of the world's fuel requirements, large-scale oil-from-coal plants may come into being, so preserving a demand for coal.

Whatever happens, the fact remains that in coal, Western Europe has its only significant indigenous fuel, and on the grounds of National security alone it is essential that the coal industry of the West remains in a healthy state.

THE STATE OF MINING IN SOUTHERN RHODESIA

In his presidential address delivered on Monday of this week, Mr. A. L. Gilmour, president of the Chamber of Mines of Rhodesia, gave an interesting survey of the mining industry as it stands today in Southern Rhodesia, tempering his remarks with a spirit of optimism for the year ahead.

Mr. Gilmour pointed out that the past year could be considered as the most difficult since the establishment of the Central African Federation, and the performance of the mining industry in maintaining a high rate of production was consequently most creditable. Recessions in the main mineral-consuming countries resulted in greatly reduced markets for Rhodesia's base metals and minerals, and the lower rate of exports had a marked effect on the economy of the country, as well as on the operations of producers.

As a result of reorganization, and in some cases suspension of operations, the mining industry, in common with other employers, was forced to reduce staff to a quite material extent; the reduction in European labour was approximately 20 per cent of the number employed in 1957. Nevertheless, the employees' organizations in the mining industry were most co-operative during this period of reorganization. The president expressed appreciation of their objective approach to the problem. He added that the industry was to be congratulated on its performance in 1958, in that the total value of mineral production did not fall very far short of the record established in 1957. Indeed, the declared value of production during the year was based on pithead values, and actual revenue to the Colony was probably nearer £40,000,000 than £25,000,000.

Mr. Gilmour went on: "There is at present a considerable amount of prospecting being carried out in the Colony, and there is every hope that mining activity will be extended in the future".

Prior to 1933, the mineral rights of the country were vested in the British South Africa Co., but in that year the government purchased those rights for £2,000,000. Since then the mining industry had paid nearly £6,000,000 in royalty to the government.

The royalty payable by gold mines was withdrawn in 1945. The royalty has, however, continued in respect of base minerals, which today represent the major portion of the Rhodesian mining industry. Base minerals consumed locally are exempt from royalty, and the government has always maintained that the imposition of a royalty on exported minerals only is to encourage the processing of these minerals in this country. While Mr. Gilmour agreed the local processing of minerals to be a very desirable development, he did not consider that the imposition of a royalty on exports would achieve this object.

"Before minerals can be processed here on a large scale", he went on, "two major obstacles must be overcome: first, the marketing of the processed mineral or metal in the face of strong opposition from established producers overseas; and second, the high and ever-rising cost of electric power in the Colony. When I say opposition from overseas producers, I do not mean the competition which any producer must face in normal circumstances, but the policy of bringing pressure to bear on a government either to prohibit imports or to place such large tariffs on imported goods that they are no longer competitive".

Since Federation, the Southern Rhodesia Government had also maintained that the imposition of the royalty on base minerals was one of the few avenues left to it for raising revenue. While the Chamber appreciated the difficulties, it considered that an unfair advantage had been taken of the mining industry which was the only one in the Colony subjected to direct taxation on the value of its product, irrespective of the profit margin of the individual mining propositions. The Minister of the Treasury had always drawn attention to the fact that the Mines and Minerals Act makes provision for the remission of royalty in special circumstances. The executive committee of the Chamber, however, now has decided that the matter should not be left as it is, and that active and positive steps should be taken to convince the government of the necessity to review its methods of raising revenue.

As reported at the last annual general meeting, during the past year the Chamber had concerned itself with the revision of the Mining Laws. The working party set up by the Minister of Mines spent considerable time studying the

Act and preparing its report on the proposed amendments to be incorporated in the new Act. The working party recommended detailed and comprehensive stages of approach with very definite and possibly expensive restrictions on the activities of the miner undertaking prospecting work over reserved ground. Prior to each stage of this prospecting, the miner has to convince the Mining Affairs Board of the probable presence of an economic mineral deposit, and would have to provide guarantees to meet compensation and other claims which may be due to the landowner. The Chamber has accepted the broad principles recommended in the working party's report which, while granting certain concessions to the mining industry, also grants considerable additional concessions to the farmers. The two industries concerned are complementary to each other and constitute the major contributors to the country's revenue. The speaker felt that it would be regrettable if the work of the government working party were disregarded.

The mining industry again had been faced with an application for increased electricity tariffs. The Chamber had always contended that the tariff structure of the Electricity Supply Commission has been inequitable between the different classes of consumers, with the mining industry being required to carry the major portion of the burden. The industry considers that the Minister will have little option but to accept its representations to order a readjustment of the tariff structure. A point which the Chamber has always considered extremely important, and again stressed at the recent hearing of the Electricity Council, is that industry requires a reliable forecast of the pattern of electricity tariffs. When it is appreciated that in the mining industry these tariffs represent approximately 15 per cent of the working costs, the importance of stability in power costs becomes only too apparent.

In concluding his remarks, Mr. Gilmour discussed the impact on the labour picture that had been made by the declared intention of the government not to exclude Africans from the definition of "employee". He referred also to the establishment of a mining training centre at the old Piper Moss mine near Que Que.

COLOUR MICROSCOPY IN ORE MILLING

Despite the large amount of technical literature that has been published on the subject of mineral dressing, little attention seems to have been paid to the application of colour microscopy in determining the mineral components of an ore. This point has now been brought into sharp relief by E. P. Caldwell in *Colour Microscopy for the Mill Man*, published by the Mining Chemicals Department of the Cyanamid Co. The author points out that, deprived of exact knowledge of the component minerals of an ore—both valuable and gangue—their physical status and their degree of locking with each other, the mineral dressing engineer is not in a position to benefit from the published material relating to the work being carried on so diligently.

It may be considered that Caldwell is correct when he suggests that the only logical approach to the design of a mill flowsheet for the beneficiation of a particular ore is to make thin and polished sections and discover what minerals are present, what their sizes are, and how they react to one another. Despite this glimpse of the obvious, most mineral dressing problems are still solved by a type of trial and error approach. Indeed, few mills are equipped with adequate microscopic equipment, while even metallurgical laboratories and schools almost completely ignore one of the most important tools in mineral dressing.

Caldwell goes on to state that a polished section of mill products, suitable for routine examination, can be made in less than an hour. The material is embedded in a thermosetting resin and the briquette ground with American Optical No. 302½ abrasive on a cast-iron lap wheel to remove plastic from the grains. Polishing is carried out on a hard, fine-weave nylon cloth over a steel lap wheel. The abrasive is 6-micron diamond paste and the lubricant is paraffin. Polishing is facilitated by first applying a briquette of about 50 per cent by volume of high-grade galena concentrate to the rotating lap together with a generous amount of paraffin; thus providing a better and more speedy polish than when paraffin is used alone. In the use of this novel method, polishing is commenced at 500 r.p.m. and gradually increased to 800 r.p.m. as a final speed. For more exacting work and for photomicrography, further grinding with 1 micron and ¼ micron diamond paste on separate laps is recommended.

Caldwell reports that he has often taken coloured slides to illustrate certain approaches to this existing mineral dressing problem. For many individuals who have not been trained in the use of the microscope, it has been found more practical to take coloured photographs of a series of particles representing the problem and then project these. Certainly it would seem advantageous that the use of colour photographs to determine the content of an ore should be popularized with mineral dressers, just as it has long been accepted that great advantages accrue from recording general geological data in this way.

MANGANESE FROM THE SEA BED

If interested American companies go ahead with plans for the development of deposits known to have existed on the floor of large areas of the world's oceans for almost eighty-five years, deep undersea mining may have a spectacular future. Vast tonnages of manganese-iron nodules with appreciable cobalt, nickel, and copper content are available at great depths off the south-eastern United States coast, off the Pacific coast, and at the bottom of the Pacific Ocean between South America and Tahiti.

The engineering study of this particular aspect of mining was sponsored by the University of California's Institute of Marine Resources, of which Mr. J. L. Mero is a graduate research engineer. Mr. Mero is about to publish a report on "The Mining and Processing of Deep-Sea Manganese Nodules", and the following information is condensed from a preview of this material.

The average grading of the material dredged up from the deep ocean beds all over the world is 20 per cent manganese, 15 per cent iron, and 0.5 per cent each of nickel, cobalt, and copper. Locally, the nodules grade as high as 45 per cent manganese, 1 per cent cobalt, 1.4 per cent nickel, and 1.8 per cent copper. These minerals, however, do not all occur in the same nodule. The cost of mining the nodules will depend largely upon the depth of dredging. If deep-sea hydraulic dredging proves technically feasible, mining costs could be kept as low as $2 per ton.

The nodules occur within several hundred miles of either coast of the United States, and the cost of transporting the nodules from the mining site to a seaport processing centre will range from $1 to $8 per ton. Manganese ore on the bottom of the Atlantic Ocean, east of Bermuda, lies at 18,000 ft. Tonnage estimates for nodules capable of being mined in all areas reach hundreds of billions of tons.

The nodules are related to a variety of manganese ores known as wad, or bog manganese. The intimate relationship of the various elements in the nodules gives little opportunity for upgrading the nodules by a flotation process. The cost of processing a ton of average grade nodules can be expected to be about $22. Once the manganese is made soluble by a reduction process, it is relatively simple to dissolve the nickel, cobalt, and copper in the nodules.

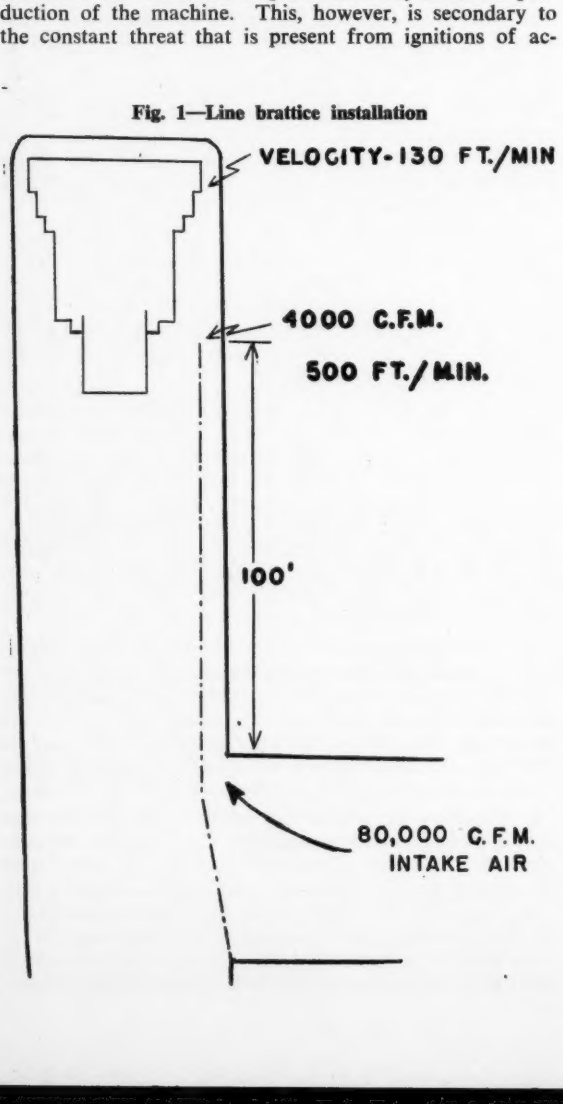
Ventilation in Continuous Mining

FACE ventilation has always required close supervision from operating personnel, but the relatively slow advance per shift with conventional mechanical systems, even in extremely gaseous conditions, lends itself to a certain degree of safety. With proper supervision, the apparatus and methods in common use have been fairly satisfactory, i.e., keeping permanent stoppings in good condition; properly located check curtains in the face area; and line brattice to course fresh air to the individual work places with sufficient volume and velocity to properly dilute methane liberated from the faces and ribs.

Recent technological advances in equipment and improved mining schemes have increased productive capacity to a great extent. The industry is now being confronted with an acute face ventilation problem. The use of the line brattice is not dependable and it does not maintain a gas-free atmosphere. These continuous machines, and especially the borer-type, virtually fill the working area and act as a barrier to the flow of air to and across the face.

With lineal penetrations at the rate of 200 or more feet per shift, these miners will expose a new face every minute. This means, where gassy conditions exist, that mining must often be stopped and the machine withdrawn to allow gas to be cleared. These interruptions seriously affect the production of the machine. This, however, is secondary to the constant threat that is present from ignitions of accumulated gas by sparks caused from cutting bits striking sulphur intrusions, pyritic lenses, etc. A paper given by G. R. Higinbotham, president of the Mountaineer Coal Co., Virginia, at the annual convention of the Kentucky Mining Institute showed what can be reasonably expected from better than average line brattice installations and illustrated the various experimental tests with auxiliary fans for safe and practical use.

Fig. 1—Line brattice installation



Continuous Sampling of Face Atmosphere

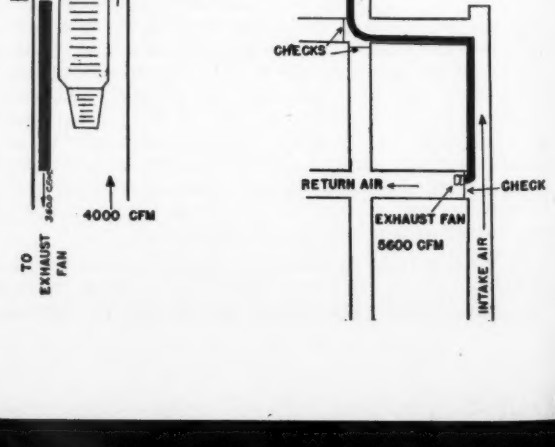
A testing arrangement was established to provide continuous sampling of the face atmosphere with and without the use of fans. The U.S. Bureau of Mines contributed much of the following data.

The line brattice is comparatively ineffective. In a full-shift study, the miner was worked on a two-step face cycle operation. On 15 occasions the methane concentration ranged from 4 per cent to slightly over 5 per cent at the immediate face. Examining the actual ventilating efficiency more closely reveals 2,000 c.f.m. of air sweeping the inbye end of the line brattice, which was usually 25 ft. back from the face. The volume of air decreased from 4,760 c.f.m. to 2,000 c.f.m., a 58 per cent drop, while advancing only 55 ft. This quantity of gas "bottled up" at the face cannot be disregarded.

In a subsequent test the ignition hazard was more predominant. In this case a 5 per cent explosive mixture of air and gas extended back more than 20 ft. from the face. Methane readings at the head of the machine were 10 per cent during the instance of the gas build-up 20 ft. outbye the face. If sparks were produced at such a moment, the outcome is self-evident. Worth mentioning also is the drop in ventilation efficiency of 85 per cent since only 2,000 c.f.m. reached the end of the line brattice with 14,000 c.f.m. introduced at the first crosscut back.

A situation was made available at a new mine where preliminary development work was near the upcast shaft. As shown in Fig. 1, fresh air was supplied at the rate of 80,000 c.f.m. at the first crosscut outbye of the face. Tremendous air leakage resulted in only 4,000 c.f.m. reaching the end of the line brattice 100 ft. inbye, or an efficiency loss of 95 per cent. A velocity of 130 ft./min. was measured at the face, which was adequate to maintain a safe working

Fig. 2—Auxiliary ventilation-exhaust system



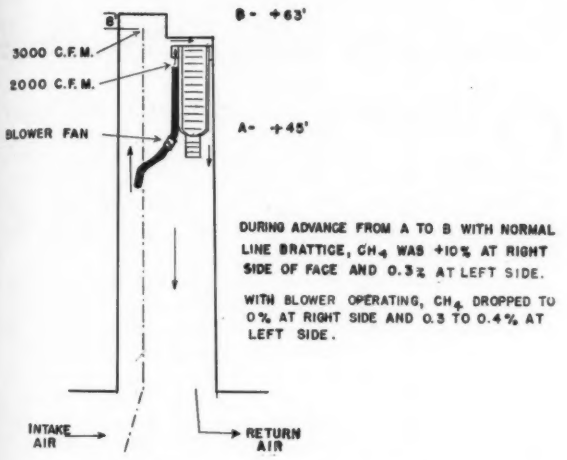

B - +63'
3000 C.F.M.
2000 C.F.M.
BLOWER FAN
A - +45'
DURING ADVANCE FROM A TO B WITH NORMAL LINE BRATTICE, CH_4 WAS +10% AT RIGHT SIDE OF FACE AND 0.3% AT LEFT SIDE.
WITH BLOWER OPERATING, CH_4 DROPPED TO 0% AT RIGHT SIDE AND 0.3 TO 0.4% AT LEFT SIDE.
INTAKE AIR
RETURN AIR

Fig. 5—Results with auxiliary-blowing system

atmosphere. Based on these figures, total air requirements for a given operation would be completely impractical to obtain. With these facts in mind, a test programme was conducted with auxiliary fans and this is most easily outlined by referring to Figs. 2, 3 and 4.

Fig. 2 shows a 5 h.p., 18-in. diameter fan producing 5,600 c.f.m. which was installed on the return air side of the place, generally in the first crosscut outbye the face. Connected to the fan was an 18-in. non-collapsible tubing which was suspended from roof spads or roof bolts to a point 15 ft. back from the face. Air was induced as far as the head of this ripper-type machine, but did not remove methane from the face.

In the experiment shown in Fig. 3 a 1½-h.p., 12-in. dia. fan, capable of producing 2,600 c.f.m., was installed on the intake air side. Tubing 1 ft. in dia. was extended along the roof to the rear of this borer-type machine. Even with the end of the tubing as much as 35 ft. from the face, there was sufficient fresh air to keep the face cleared of gas. The only objection was the dispersal of dust.

Fans in Combination

Up to this time experiments indicated the best approach was with two fans working in combination. In Fig. 4 a system with a small blower fan forced approximately 2,000 c.f.m. through a 6 in. by 12 in. metal conduit that was attached to the machine, with a larger fan exhausting through the suspended 18-in. tubing. This exhaust fan produced over 5,000 c.f.m.

During the advance from A to B as illustrated in Fig. 5, a line brattice was used 8 ft. from the face. Without the blower fan running, methane was more than 10 per cent at the right side and 0.3 per cent at the left side of the face. The instant the blower was started, methane dropped to zero per cent on the right side. The face on the left remained about the same. When the blower was stopped gas built up immediately, but the face remained clear while the fan was operating.

Fig. 6 (overleaf) substantiates the advantages of dual-fan blowing and exhausting. In the advance from A to B, the methane concentration increased to 1.4 per cent at the left face with only the exhaust fan operating. Without either fan running and using only the line brattice, the methane reading was 2 per cent. With both fans in use a reading of 0.2 per cent was recorded.

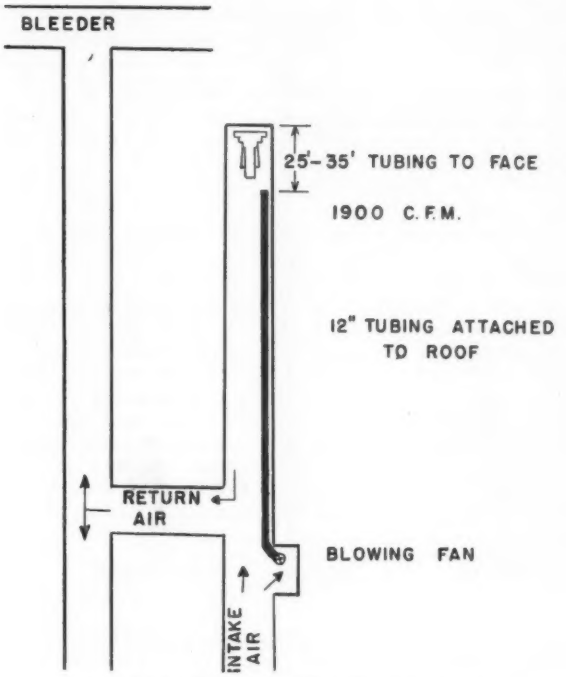
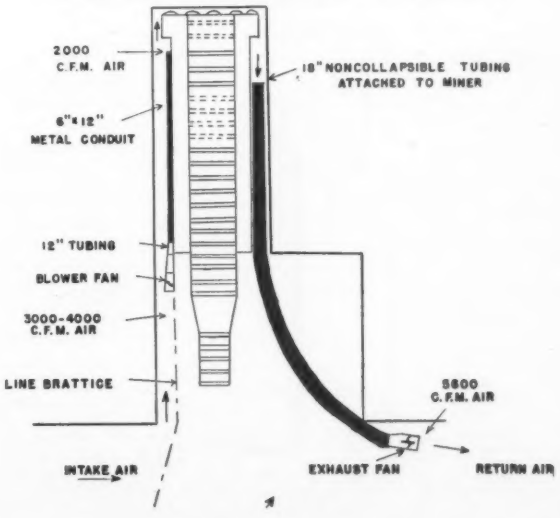


Fig. 3—Auxiliary ventilation-blowing system

Although the results indicated that the blowing systems alone can be used within certain limitations, the combination of two fans appears more promising. However, the complexity of working dual tubes prompted experiments with the blower fan as an integral part of the miner itself. This system is illustrated in Fig. 7 (overleaf).

A small blower-type fan 20 in. high, 16 in. wide and 13 in. long, weighing only 100 lb., can be installed on either side of the machine. It is designed to produce from 500 to 1,000 c.f.m. through a 6-in. tube or metal conduit attached to the machine and directed to the immediate face area. In this particular installation, 14-in. non-collapsible tubing will be used at the face, with a 5 h.p. fan exhausting in the return airway.

Fig. 4—Auxiliary ventilation-combination system



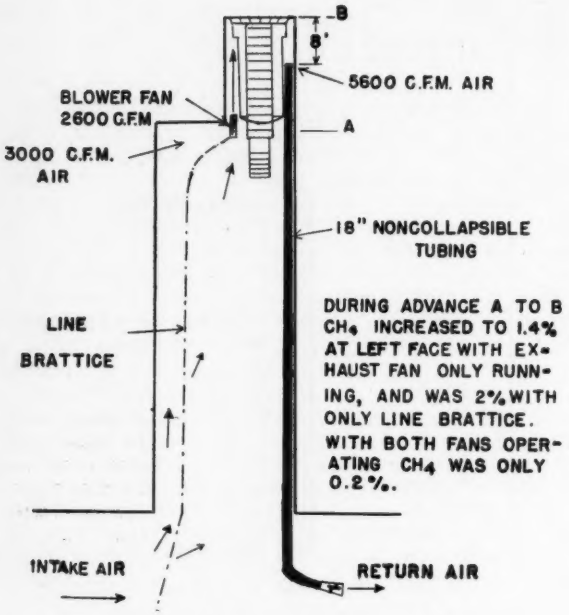


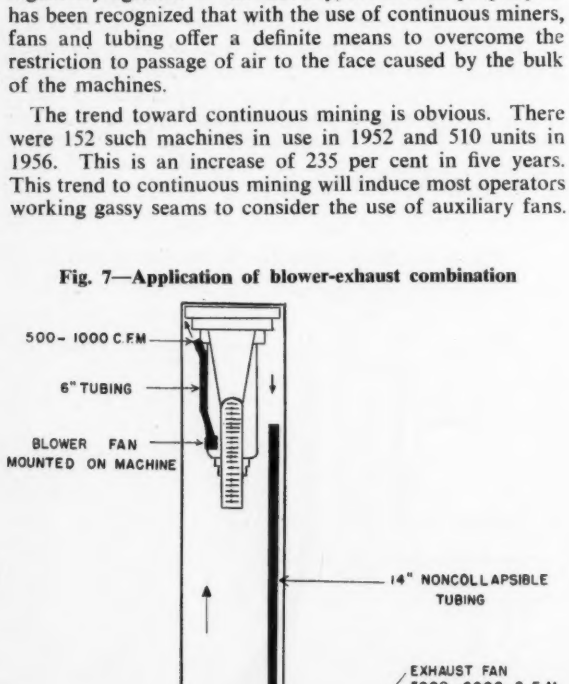
Fig. 6—Results with auxiliary ventilation

Conclusions derived from the tests described in this article and similar experiments indicate that line brattice cannot be expected to provide the safest and most dependable atmosphere in continuous miner places. It would appear, therefore, that auxiliary fans offer an advantage.

Auxiliary fans, previously discounted because of abuse in practice, are now being considered by the several regulatory agencies in the industry, when used properly. It has been recognized that with the use of continuous miners, fans and tubing offer a definite means to overcome the restriction to passage of air to the face caused by the bulk of the machines.

The trend toward continuous mining is obvious. There were 152 such machines in use in 1952 and 510 units in 1956. This is an increase of 235 per cent in five years. This trend to continuous mining will induce most operators working gassy seams to consider the use of auxiliary fans.

Fig. 7—Application of blower-exhaust combination



Some Ancillary Electro-

ONE of the features of some of the large metallurgical corporations is that not only ingot metals are produced, but also finished products for various different industrial activities are supplied. In many of these, electrical applications occupy a prominent part, and the following is only a very brief account of some of the methods utilized.

Amongst some of the more unique electro-deposition systems, powdered nickel is prepared in diaphragm cells from the sheet-metal anodes, and following filtration of the fine deposit from the electrolyte, this nickel is dried and disposed of in the form of fine metallic powder for the making of various small parts by the application of considerable pressure. A different system is engaged for the electro-deposition of powdered bronze, where prepared solutions of copper and tin are used for the electrolyte with inert anodes. The product is much in demand by the automobile industries for the making of oil-less bearings, etc. In this case the metal, following compression, has to be subjected to appropriate heat treatment in order to acquire the desired alpha structure.

A further process is employed for the production of powdered iron, used for magnet cores, and other units in the electrical industry, and the hardness or ductility of the deposit can be altered by varying the conditions of deposition. Iron electro-deposition, however, has to contend with a much larger absorption of hydrogen than is experienced with nickel. The bath here is made up mainly of ferrous sulphate and ferrous chloride, frequently within a fixed pH value range and with small amounts of addition agents, and operated at some 70 deg. C.

Current densities which have been quoted for these processes have to be taken with caution since although nickel, bronze, and iron can be deposited at normal ranges of from 10 to 20 amp. per square foot in order to ensure a clean, fine deposit, very appreciably greater densities are often necessary; and these would render the process uneconomical for products other than in the desired finely pulverent condition. A small department of the works is laid aside for this production of powdered metals. An addition to this is the preparation of powdered copper, which, however, is more economically obtained by grinding the heat-treated metal to fine condition, as is done elsewhere, but on a much more elaborate scale, and which necessitates the inclusion of cyclones and other special dust-collecting mechanisms.[1]

Range of Products

Another factory connected with a large smeltery not only provides powdered metals but also precipitated salts of metals by electro-deposition. The regular layout here is already established for white-lead production by the electrolytic system. Instead of having first to acquire solutions of salts of the particular metals, as is necessary in the normal chemical factory, the specialized character of the diaphragm cell, with separate anode and cathode compartment, permits the original sheet metal, used as anode, to suffice to provide one constituent.

During the progress of the electrolytic action the anolyte passes into the catholyte section, where the particular selected precipitant is continuously added. The precipitate so formed is filtered continuously as formed and passed to continuous dryers. Hence, apart from white lead, the same system is employed for the production of cupreous oxide, lead peroxide, and arsenate, and a wide range of similar

...ectro-metallurgical Processes

insoluble compounds of antimony, zinc, cadmium, chromium, and other metals.

In each case the system is altered only to permit a fresh type of anode of the particular metal and replaced precipitant for the catholyte, otherwise the same plant layout suffices for each product. The success of this activity largely depends upon the acquisition of cheap current, but saves the cost of initially acquiring salts, since only the precipitant has to be purchased, and thus holds the great advantage of permitting all processes to proceed on a fully non-stop, continuous basis.[2]

Features of Specialized Tin and Zinc Refining

While a description of electro-refining of tin has already been dealt with, one of the practical points is where, unlike the regular product from ores, that obtained from scrap tin-lead-antimony alloys has to be dealt with. During the progress of the electrolytic action tin here tends to come down promiscuously in view of the widely varying contents. Although deposited on a cathode of tin sheet, the faces of anode and cathode can differ materially according to the contents. For this reason one expedient is to periodically remove two tin cathodes from either side of an anode and proceed with other cathodes.

Another difficulty experienced is that the antimonial sludge recovered is sometimes so extremely difficult to filter, i.e. after washing out associated salts, that recourse has had to be made to simply allowing the collected white, muddy liquors to slowly evaporate within large drying pans located over heated flues. This somewhat roundabout improvisation is caused through the exceedingly fine nature of the deposit, which apparently passes through all ordinary filter cloths, while alternative filtering arrangements get clogged up. Unless some fresh procedure has been adopted, this arrangement appears to be still followed. Two different metallurgical companies were evidently troubled with the same difficulties. Regular ores and residues with smaller antimony contents provide anodes which do not involve adaptations of the kind. The normal fluosilicate baths are operated at some 25 amp. per square foot, the electrolyte contains about 5 per cent tin, but here the anodes contain 96 per cent tin.[3]

By C. C. DOWNIE

One of the more unique smelting processes is in the production of a variety of zinc suitable for photo-engravers' purposes and for which electric furnaces were proposed, but do not appear to have been persevered with. One concern making a speciality of this has a section of the normal distillation process devoted to making these zinc plates. Despite the specialized characteristics required, the product is made direct from the ore. Following distillation in a closed chamber with the zinc passing off as vapour, the metal is collected in the cooler part of the chamber, where it is drawn off at three intervals and cast. The first, second, and third draw differ in composition depending on the lead, cadmium, and iron in the original ore. In addition, the characteristics of each "draw" differ and require to be kept separate from the others. Although generally quoted as photo-engravers' zinc, it is really an alloy, since pure zinc is entirely unsuited for etching and the rough treatment of the printing press.[4]

One of the undesirable wastes which accumulates in different wet-extraction processes is that of sodium sulphate solutions, which frequently, to the present day, are run to the nearest sewer. (A pre-war case on record shows that, although the market price of solid sodium sulphate was then quoted at some £3 per ton, it had been sold off at 15s. per ton to get rid of it and save space.) One of the electrolytic processes demonstrated for handling sodium sulphate solutions comprises passing this into cells equipped with asbestos diaphragm, whereby the sulphate ion is attracted to the positive electrode, loses its charge, and reacts with water to form sulphuric acid and oxygen, while by reversing the polarity the acid can always be formed at the positive electrode and soda at the negative electrode. This process can be arranged to produce sodium bisulphate, used for extraction purposes and also as a flux. The economical success of these methods would appear to depend on the acquisition of cheap current supplies. A further electrolytic system comprises decomposing solutions of sodium iodide in another type of cell with asbestos diaphragm, which in some respects follows that of decomposing sodium chloride solutions. Sodium hydrate is formed at the negative electrode and iodine at the positive electrode.

The means of acquiring rich or, when necessary, duly enriched iodide liquors would have forestalled the need for large storage tanks and the necessary extra pumping involved. A further adaptation of this electrolytic system is the enclosed cell with diaphragm similar to what is employed for sodium hypochlorite production, and which, it is stated, can produce sodium iodate, although little information is so far obtainable. The latter salt was for some time used in large-scale thorium recovery.[5]

Air Separation and Electro-magnetic Separation

The electrostatic precipitator has already been well established for collecting fume, but the air separation of this accumulation has been the subject of fluctuating popularity, since it was abandoned, but in some quarters has been revived again. The graded product lends itself to treatment, since the heavier particles are then given better opportunity to descend before the lighter ones. Not a few speculations were made on the basis that as lead oxide has a density of 9 compared with arsenic, antimony, and tin oxides, at approximately 3.7, 5.6, and 6.1 respectively, this might permit much of the lead being got rid of.

In practice, a certain form of combination tends to offset this advantage, quite apart from the presence of oxides of zinc and other heavy metals. Despite this, air separation is rapidly performed and can be repeated in a short space of time, and so far as silver and precious metals are concerned reduces these to a few ounces per ton. It was these last few ounces, however, which gave concern to more than one metallurgical corporation and necessitated an alternative arrangement being introduced. Apart from this, a combination of air separation with electro-magnetic separation permits the work to proceed in a straight line in the desired non-stop manner. Some undertakings connected with dry pigment production have done not a little to develop improved air-separation systems.[6]

REFERENCES

1. U.S. Metals Refining Co., Carteret, N.J.
2. International Smelting and Refining Co., S. Chicago, Ill.
3. American Smelting and Refining Co., Perth Amboy, N.J.
4. Atlantic Zinc Works, Brooklyn, N.Y.
5. Franklyn Institute, Philadelphia, Penn.
6. Federal Classifier Systems Inc., Chicago, Ill.

The Geology and Mineral Resources of Kazakhstan

THE territory of Kazakhstan, situated at the crossroads of Europe and Asia, and consisting of some 2,800,000 square kilometres, was until the Socialist Revolution little more than a great white spot on the map. Today the Kazakhstan geologists form one of the strongest detachments in the geological army of the U.S.S.R.

The country is also among the first places in the U.S.S.R. with regard to natural wealth in manganese, molybdenum, coal, potassium and other mineral salts, nickel, titanium, cadmium, indium, rhenium, and many other rare and common elements of great importance in modern industry.

It has been established that there are over two hundred distinct deposits of bituminous coals, lignites, coking and fuel coals scattered over almost every district of the Republic. Kazakhstan's oil deposits are connected with the salt domes. Of roughly 1,500 salt domes which geophysical investigations have revealed in the Ural-Embensk basin, only a few dozen have so far been explored.

The Mangyshlak Peninsula, the Aral region, Iliisk, Alakolsk, the Zaisansk depression, and the Turgansk depression are all geologically promising with regard to petroleum. Deposits of fuel gases have been found to exist in the regions of Ural-Emba, Furmanov, and Aktyubinsk.

The following article is condensed from *Geology and Mineral Resources of Kazakhstan*, by K. I. Satpaev, and is a translation from Vestnik Akademii Nauk S.S.S.R., 1957 (10) (60-65). A translation of the complete article is available from the D.S.I.R Lending Library Unit at £2 8s. in the U.K. or £3 12s. overseas.

Iron and Manganese

Until the October Revolution, no iron ore deposits were known to exist in Kazakhstan. Today, the country occupies one of the first places in the world, as well as in the U.S.S.R., for iron reserves. Of the vast deposits of magnetite-haematite ores, of the Swedish and magnetic type, the Sarbai-Sokolovsk group in the Kustanai complex is particularly important. To this type belong the Atasutsk deposits, which form the ore reserves for the Karagandinsk iron and steel works now under construction, and also the Atansorsk and Ken'tobinsk groups of deposits in Central Kazakhstan.

Several types of manganese ores have been found to exist in Kazakhstan. The rich braunite-psilomelane ores of Dzhezda, which are free from phosphorus and sulphur, constitute first-class raw materials for the production of ferro-manganese, as do the deposits of the Atasutsk group, Murdzhik, the region near the Ishim, Arkalyk and Mugodzhar, which contain five times less phosphorus in the ores than are to be found in the Nikopol and Chiaturi ores. Ferro-manganese deposits rich in phosphorus exist in the regions of the Karatau range, Karaganda, and elsewhere.

Deposits of Copper

With regard to copper, Kazakhstan already occupies one of the first places in the world, although its wealth in this mineral is still far from being fully known. Its resources include the Dzhezkazgan deposits, where vast mineral resources exist side by side with exceptional industrial and economic facilities. Forty per cent of all the ore reserves at present known to exist here can be extracted by highly economical open-cut mining.

Apart from copper, the Dzhezkazgan ores contain lead, silver and sulphur, which are now extracted as by-products, and also zinc, cadmium, bismuth, cobalt, molybdenum, rhenium, germanium, selenium, tellurium, and other constituents which at present are lost in the process of industrial conversion.

Kazakhstan also has copper-pyrite ores, which are characteristic of the Urals. But unlike the Ural deposits, many of these can be worked by open-cut methods. The most famous of the copper deposits of this type is that of Nikolaevsk in the Altai, which it is proposed to use as a basis for a huge copper-zinc works. Nearly two-thirds of all the lead reserves and about half of all the zinc in the U.S.S.R. are concentrated in Kazakhstan.

Oxidized nickel silicate ores are widely used in Kazakhstan. The main deposits are in Western, Central, and Eastern Kazakhstan. The ores contain cobalt as well as nickel. Kazakhstan also possesses vast reserves of high-quality bauxites.

Other Minerals

From the salt-water lakes of the Mangyshlak Peninsula and the Pavlodar region, and also from the vast dolomite deposits of the Kokchetava, Balkhash, and Dzhezkazgan regions, magnesium can be obtained. In the Cambrian siliceous coal shale layers in regions of Southern and Central Kazakhstan, vanadium is found. These shales also contain molybdenum, lead, and a number of other common metals. Strata-forming beds of chromites are to be found in the Kempirsaisk complex of ultrabasics in the Aktyubinsk region, and these supply the Aktyubinsk iron smelting works, the largest in the U.S.S.R.

With the opening of the deposits at Chebynda and Dzhilanchik in the Great Turgai region, Kazakhstan became one of the first sources in the U.S.S.R. of titanium. Deposits of titanium ore have also been found in the Kalba, North Balkhash, Chelkar, Semiz-Bugu, and other regions. Rhenium, antimony, cadmium, indium, thalium, selenium, tellurium, bismuth, gallium, and hafnium have been found to occur as admixtures in the copper and polymetallic ores of Rudnyi Altai, Central and Southern Kazakhstan. In Rudnyi Altai, Kalba, and Northern and Western Kazakhstan, it is known that there are vast deposits of gold and silver.

Kazakhstan occupies one of the leading places in the U.S.S.R. for its wealth in both chemical raw materials and building materials, the latter including large deposits of asbestos. There are large deposits of asbestos in Dzhetygar, Eshkiolmes, Shaitantas, and other parts. Such then, in general outline, is the pattern of the rich and variegated mineral wealth of Kazakhstan as it is known today. For the further study of its natural resources, the first requirement is the development of geological and cartographical studies.

MINING MISCELLANY

An American Aid financed air survey by the Arrow Service Corporation, of Philadelphia, costing $U.S.800,000 has begun in north and north-east Thailand. The object is to seek mineral deposits, especially any radioactive minerals.

★

Plans are now being put into operation which would raise Poland's zinc output from 162,600 tonnes in 1958 to 230,000 tonnes in 1965.

★

Iron ore reserves, that even with the most intensive exploitation will last over 100 years, have been prospected at Mount Kachkanar, in the central Urals. The country's biggest ore dressing plant is being built nearby.

★

Exports of iron ore from Angola for the period January to November, 1958, totalled 172,000 tons, valued at 59,800,000 escudos. Western Germany was chief buyer with 168,900 tons, value 58,600,000 escudos.

★

Soviet specialists are completing the designing of an iron and steel mill with a full production cycle for Bulgaria. It is to be erected some ten miles north of Sofia and will work on the iron ore deposits recently discovered there. The mill is going to be one of the biggest iron and steel establishments in Western Europe. It will produce 1,300,000 tons of steel, over 1,100,000 tons of pig iron and about 1,000,000 tons of rolled metal a year.

★

Exploration of placer-tin deposits on the western tip of Alaska's Seward Peninsula, near the Arctic Circle, has been described in a United States Bureau of Mines publication. The project was conducted by private interests, with government financial assistance, under the Department's Office of Minerals Exploration programme in an area known as the Cape Mountain placer-tin district. Although now idle, the area produced more than 500 tons of tin between 1935 and 1941. Bureau of Mines sampling early in World War II had indicated that further investigation of the deposits was warranted. A copy of Information Circular 7878, "Tin-Placer Sampling Methods and Results, Cape Mountain District, Seward Peninsula, Alaska", can be obtained from the Publications Distribution Section, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pennsylvania.

★

The Dead Sea Works, Israel, has recently reported that production of potash during the first three months of this year reached 27,000 tons, which is 5,000 tons above the same period in 1958. In addition to producing potash, the company supplies the local market with magnesium chloride, with some calcium chloride, and with common salt. It produces at the Sodom works 99 per cent pure salt for industrial purposes, and it has furnished the Dead Sea Bromine Co. Ltd. at Sodom with its raw material.

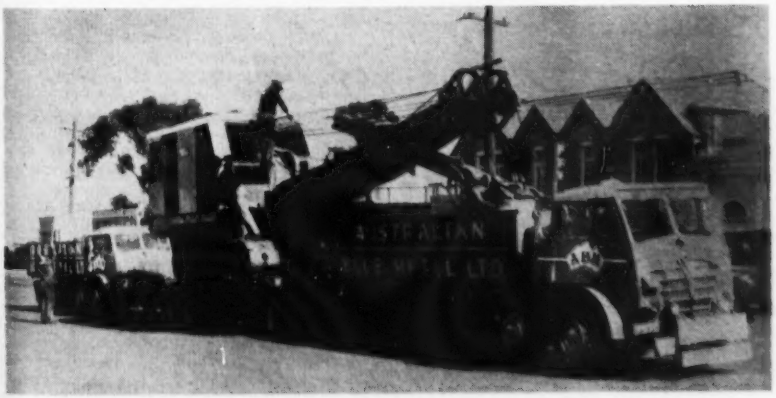
★

The passage of an amendment to the Mining Act by the Ontario Legislature recently means prospectors may now, if they wish, purchase claim tags before actually staking claims, and attach them at the same time that they set up their claim posts. The cost of the tags is deducted from the fee for recording. Those prospectors who elect to work by the old method may still do so, but the time allowed for tagging the claims is reduced from one year to six months. Provision was also made by the Act for the appointment of an official to carry out some of the more urgent duties of the Mining Commissioner during his absence from duty at any time.

★

The local Press reports that deposits of coal have been found at Askersuyu, Amasra, in Turkey (not far from the hard coal deposits at Zonguldak).

Two Foden Model FG 6/24s were used on a push-pull basis in Australia to transport a 38 R.B. shovel from Perth to a quarry site at Karoni (a distance of 410 miles). The shovel weighed approximately 48 tons



PERSONAL

Mr. J. E. C. Bailey, C.B.E., chairman and managing director of Baird and Tatlock (London) Ltd., and Hopkin and Williams Ltd., left the United Kingdom on April 18 for Canada and the United States.

★

We deeply regret to announce the death at Rugby on April 24 of Mr. K. R. Hopkirk, who until he retired on December 31, 1958, was director and chief mechanical engineer of the British Thomson-Houston Co.

★

A prominent oil-gas geologist is to be the next president of the Canadian Institute of Mining and Metallurgy. He is Dr. J. C. Sproule, and he will hold office for one year.

★

The boards of Ashanti Goldfields Corporation Ltd., and Bibiani (1927) Ltd., have accepted with regret the resignation of Lord Ismay on the grounds of ill health.

★

Mr. V. T. Hockin, C.B.E., the Commissioner for Mines for Tanganyika, sailed from Dar es Salaam for Britain on retirement on April 10. He is to be succeeded by Mr. W. D. Harverson, O.B.E., at present Commissioner of Mines and Geology for the Kenya Government.

★

Short and Mason Ltd. announce that Mr. William K. Gregson has joined them as the Northern Area Representative and will operate from 32 Park Road, Sale, Cheshire.

CONTRACTS AND TENDERS

Spain

Blister copper, minimum 98.5 Cu contents, in slabs and/or ingots, maximum weight 1,000 lb. each to the value of $963,000 f.o.b. Project Implementation Order No. 52-6921-99-PL-9203. Sub-Authorization No. 9203-1. Issuing authority and address to which bids should be sent, Compania Auxiliar de la Industria del Cobre S.A., Calle del Principe 12, Madrid, Spain. Closing date, May 12, 1959. Ref. ESB/9604/59/ICA. Telephone inquiries to Chancery 4411, extension 354.

Spain

Manganese ore to the value of $325,000 on commodity f.o.b. Project Implementation Order No. 52-6507-99-PL-9205. Sub-Authorization No. 9205-1. Issuing authority and address to which bids should be sent, Consejo Ordenador de Minerales Especials de Interes Militar, Genova 13, Madrid. Closing date, May 11, 1959. Ref. ESB/9651/59/ICA. Telephone inquiries to Chancery 4411, extension 354.

Pakistan

One gravimeter, master geodetic model, 1 gravity computer, 1 electro-magnetic ground equipment, 2 magnetometers, 1 widco logger, 1 fluid resistivity kit, 1 oscilloscope, 6 geiger tubes, 22 stereoscopes, 2 height finders, and 4 photogrammetric computers, etc. Project Implementation Order No. 91-21-073-9-81982. Tender No. CT-S/ICA/344/57555/L/59. Issuing authority and address to which bids should be sent, the Director-General, Department of Supply and Development, Frere Road, Karachi. Closing date, May 14, 1959. Ref. ESB/10127/59/ICA. Telephone inquiries to Chancery 4411, extension 354.

Machinery and Equipment

A Multi-purpose Tractor

As a result of the success of a previous model on soft land, waterlogged conditions, and difficult land surfaces, a much larger and more powerful version of the Albion-Cuthbertson Water Buffalo tractor has now been brought into production. The larger machine retains the two most important features which were incorporated in the original model, the first being the Cuthbertson patented flexible rubber and wire rope tracks, which give excellent ground adhesion by enveloping the ground surface instead of riding the high spots, and giving a ground pressure of 2 lb. per sq. in. The second feature of the Water Buffalo is the water-tight hull, which ensures that the engine, transmission and steering arrangements are dry, even when the machine is operating in 4 ft. of water, and the hull prevents the tractor from sinking in peat or mud.

The general specification of the Water Buffalo is: working length, 23 ft. 4in., width (normal), 11 ft. 6 in., width, complete with amphibian body, 16 ft., working height, 11 ft., ground clearance, 1 ft. 4 in., weight, 24 tons (approx.), working ground pressure, 2.5 lb. per sq. in., and drawbar horse power, 135 lb. per sq. in.

The special hull of the Water Buffalo ensures that the tractor is capable of fording up to 4½ ft. of water with safety. To this hull can be fitted an amphibian body, which enables the tractor to float in free water, and ensures that the machine can be used with safety for crossing delta areas. Considerations such as this show that the Water Buffalo has obvious applications in mining.

The tractor is supported on two large unsprung idler wheels at the rear, and 10 sets (five on each side) of idler wheels on sprung crank axle assemblies. The tracks fitted to this tractor are the most important feature around which the design is built. These patented tracks have eliminated the conventional link pins and bushes, and instead of pins and bushes, the track links are joined by means of flexible rubber pads, which are moulded round a series of wire linked ferrules, to take the track bolts. This arrangement provides an extremely flexible track, which is able to conform accurately to the undulations of the ground surface. The track design also greatly reduces track wear.

In order that the machine can be satisfactorily handled by semi-skilled European or native labour, all controls, including steering, braking, operation of capstan winch and gin-pole winch, have been arranged by air control methods. A heavy-type air compressor is fitted on the vehicle, which gives an adequate air supply for gearbox controls and all other units. No manual control is employed on this machine, and this feature greatly simplifies the operation of the various items of equipment.

An hydraulically operated bulldozer blade has been fitted to the tractor to enable the machine to blaze trails through virgin country, forest land, and swamp conditions. It should be clearly understood that the bulldozing equipment is an attachment to the tractor for the purpose of making preliminary roads into inaccessible sites.

The Albion-Cuthbertson Water Buffalo tractor

To enable the Water Buffalo to undertake various operations required in exploration surveys, as well as the erection and transport of drilling rigs, the tractor has been fitted with a special winch and gin-poling arrangement at the rear. With this winch and gin-poling arrangement, a lifting capacity of up to 10 tons can be obtained. The winch is specially geared to enable lifting and transport of drilling rig components, and has a sufficiently low operating speed to assist in the erection of these components when being used as a crane.

One of the most interesting features of the new tractor is that it can be fitted with a capstan winch specially designed to run at track speed in all gears. This means that in land conditions where the surface of the land is unable to transmit the drawbar pull exerted by the tractor, the winch can be used as an additional means to gain the necessary tractive effort. By a special arrangement on the winch the tractor can run on a permanent cable; for instance, when a section of free water is encountered where the tracks of the tractor cannot assist in propulsion.

It has been found that the most satisfactory method of transporting loads by the use of the Water Buffalo is in the form of barges or slipes which are pulled behind the machine. These slipes can be offered in a range to take payloads of 5, 10, 20, and 28 tons. All of these slipes can be fully amphibian when loaded so that the loads can be transported by water as well as land. All slipes are fitted with large aircraft-type wheels.

HEAVY-DUTY FACESHIELD

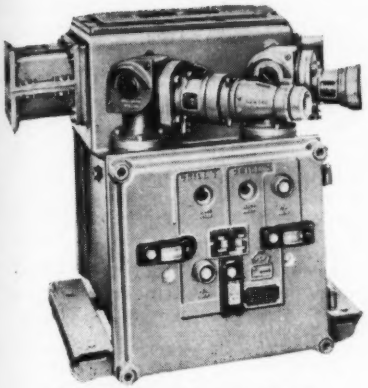
Safety Products Ltd. have added a new model to their safety faceshield range known as the Supervizor 500 faceshield. Designed for heavy duty, its special features include a broad and deep fibre-brow-guard extending well over the head; worm gear adjustable headband enabling alteration to size by a simple flick of the finger; keyhole slotting on the vizors making dislodgment virtually impossible; all types of prescription spectacles or goggles may be worn with the faceshield without discomfort.

NEW BARREL DISPENSER

A new, economic, air-operated barrel dispenser, fully automatic in operation and requiring virtually no attention, has been developed by Suba Hydraulics.

The instrument will deliver liquids without fluctuation or pulsing at the rate of 15 g.p.m., dependent on the type of the vessel and the viscosity of the liquid. Other than the delivery valve, which is manually opened and closed, there are no moving parts and thus deterioration through wear is negligible. There are no vanes, rotors or pockets where contamination could take place and consequently all that is required when changing from one liquid to another is one simple flush out. Easy to handle, the dispenser consists of a solid drawn steel tube riser pipe with aluminium valve body, air regulator body and barrel adaptor.

The air control valve ensures that the storage vessel (40 gal. drum, etc.) is not subjected to more than 5 lb. per sq. in. pressure. In addition, an excess pressure safety valve is fitted to bleed away excess air pressure in the unlikely event of the air control valve not functioning.



The S.D.U. drill control unit

Known as the Suba Model 108 Air-Operated Barrel Dispenser, the instrument can be manufactured in stainless steel or other suitable materials when contamination has to be avoided. It can also be used as an integral part of a closed circuit system in conjunction with dial meters, float level control systems and pressure distribution circuits.

ELECTRICAL EQUIPMENT FOR MINES

The type SDU drill control unit, a new addition to the Belmos range of flameproof motor control gear designed to N.C.B. specification, is suitable for controlling one 3 h.p. drill or two 1½ h.p. drills from a.c. supply systems up to 650 V. It is certified flameproof by the Ministry of Power under Certificate No. 4087 for Group 1 gases.

The 3-phase transformer has a continuous rating of 2.5 kVA., the contactor operating coils and low voltage transformers are supplied at 550 V. from the primary winding and the two drill circuits are supplied at 125 V. from two secondary windings. A special feature is that, by means of movable links, the unit can control either one 3 h.p. drill or two 1½ h.p. drills. When a 3 h.p. drill is being used, only one of the two contactors fitted in the unit is employed since each has sufficient capacity to switch this size of drill. The two triple-pole a.c.-operated contactors are rated at 30 amp. and comply with BS 775:1956 for category of duty a.c. 4. The two drill circuits are identical and each has its own protective gear.

The type SLU lighting transformer unit is the most recent model in the Belmos range of flameproof equipment designed to N.C.B. specification and is certified flameproof by the Ministry of Power under Certificate No. 4180 for Group 1 gases. The unit can supply either three lighting circuits with a maximum capacity of 13 amp. each or one circuit of 40 amp., thus supplying sufficient current for approximately 45 100-watt lamps or 75 60-watt lamps. By means of a series/parallel link board an output of either 115 V. or 230 V. can be selected; these outputs may be varied to give 125 V. and 250 V. respectively. Earth leakage protection at all voltages is incorporated.

The single-phase transformer has a continuous rating of 4.5 kVA. and has its primary winding fitted with variable tappings on the incoming side to provide fixed output voltages from supply voltages between 400 and 650 V. By means of a series/parallel link, the transformer secondary windings can be connected either in parallel to give 115 and 125 V. or in series to give 230 and 250 V. By means of movable links the transformer can supply one 40 amp. lighting circuit or three 13 amp. circuits at 115/125 V.; at 230/250 V. the unit can supply one 20 amp. or three 6 amp. circuits. HRC fuselinks protect each of the outgoing circuits.

Following the introduction of the N.C.B. (Production) Codes and Rules (1955) governing the use of underground compressors, a variety of devices has been marketed to provide compliance with the requirements regarding automatic protection against overheating. Some of the equipment is simple and effective though limited in scope whereas other pieces are elaborate and costly. The recently introduced Belmos ALR unit offers a simple and economical solution to the problem, giving audible and visible warning and automatic protection and capable of flexibility in the number of protection points which can be incorporated. It can be used with a wide variety of hand and automatic starters, including those fitted with control at line voltage as well as those with intrinsically safe control circuits.

COLLIERY PRACTICE OVERSEAS

The Hainaut and Bernissart collieries in Belgium have deepened several of their shafts by simultaneously sinking and lining, i.e., lining with suspended form blocks as soon as sinking has proceeded another 4 ft. The work is so organized that the unlined shaft section at any particular time does not exceed 5 ft.

A safety platform is suspended at a distance of 30 to 80 ft. from the shaft bottom and includes a trapdoor for the passage of the winding cage as well as a loading grab. The latter holds 21 cu. ft. and two cycles are normally needed to fill the mine car on the cage. The form blocks are made from vibrated concrete and have a vertical oblong hole through which passes a 5 ft. long suspension steel bar 8 in. by ⅞ in. section. It is secured to the block by two 2 in. dia. bolts.

The twenty blocks for one complete shaft ring are placed in less than two hours. When twelve rings have been placed, concrete is injected in the space between the blocks and the ground.

Pneumatic stowing machines, driven by a 30 h.p. air motor, need 880 cu. ft. of air per min. at 70 lb. per sq. in., in addition to about 4,120 cu. ft. of air per min. for stowing. The Louisenthal Colliery in the Saar has saved the 880 cu. ft. of air by branching off 1,470 cu. ft. for the air motor and adding the exhaust from the motor to the stowing air. As the stowing machine motor now works against a back-pressure of 35 lb. per sq. in. its nominal h.p. has to be increased to 50 or 60 h.p., but as its exhaust is added to the stowing air, the important economic advantage of a saving of 18 per cent in compressed air consumption remains.

Whenever the stowing pipe becomes clogged, the stowing machine now stops automatically and re-starts when the pipe becomes free so that the pipe cannot be rammed solid inadvertently if the motor is not stopped in time. This is, therefore, a valuable feature.

Fungi and bacteria which are responsible for the many cases of foot infection in pithead baths are claimed to be effectively destroyed by the Myxal disinfectant prepared by Dr. Karl Thomae Ltd. It is diluted with water in the proportion of 1 to 1,000 and forms a germ-destroying film.

Infra-red stoves are now available which help to speed up the drying of coal samples for the determination of moisture content. An apparatus on this basis which extracts a sample from a flow of material, weighs it before and after drying, and records the moisture content continuously has been developed. When applied to coking coal, eight samplings can be taken per hour. The specific gravity of a sample is determined with the help of Mohr's balance by finding the difference between the weight in air and the weight under water. This method is best suited to grain sizes above ¼ in.

An alternative method uses the pyknometer in which the sample volume is found by adding water to it until a container of known volume is full.

Continuous methods for the determination of the dielectric constant have been developed by Brabender, of Duisburg, and Lippke, of Neuwied. A rapid method of moisture determination with an accuracy of 3 per cent utilizes the fact that the reaction of calcium carbide with water leads to the development of acetylene, the pressure of which is proportional to the moisture content if the reaction takes place in a totally enclosed vessel of constant volume.

NEW ETCH PRIMER

In the battle to beat rust and corrosion in metals, a new etch primer is now being marketed by Federated Paints Ltd. This new Strathclyde Etching Primer PA-10 has recently received Admiralty approval for use on non-ferrous metals.

Because of its stability, PA-10 ensures the uninterrupted application by spray-gun which is so essential in automation. It is equally effective applied by brush, spray or by dipping and by any of these methods air dries quickly in 30 minutes. It may be stoved for even quicker drying.

This is not a paint, but a metal conditioner. On aluminium sheeting, zinc sprayed metals, shot-blasted steel and on all ferrous as well as non-ferrous metals, it bonds itself to the surface by means of its etching action. Adhesion on mild steel, or on cadmium plate, is such that over 3,000 lb. per sq. in. pressure would be required to achieve removal.

HEAVY-DUTY BUCKET

Dohm Ltd. have developed a new polythene heavy-duty bucket which is non-corrosive and virtually unbreakable. The bucket is specially designed to withstand the roughest treatment.

Apart from being acid proof and mouldproof, the " non-stick " surface of polythene makes it ideal for cleaning out after use. Being flexible and having no sharp edges, the sides of the bucket can be easily pressed in to remove the lumps of hardened cement and plaster. Although similar in shape to the conventional type, the new Dohm bucket weighs only 2¼ lb. and will hold up to 3 gals.

Metals and Minerals

U.S. Chromite Consumption Fell 31 per cent Last Year

During 1957, United States domestic consumption of all grades of chromite ore and concentrate decreased by 5 per cent as compared with the previous year. The latest statistics issued by the Bureau of Mines, U.S. Department of the Interior, show a further decrease in domestic consumption during the past year of no less than 31 per cent.

Last year the metallurgical industry consumed 778,000 s.tons of chromite ore and concentrate (47 per cent Cr_2O_3), of which 766,000 tons was used in producing chromium ferro-alloys and chromium metal, and 12,000 tons was added directly to steel. Producers of refractory consumed 305,000 tons (35.2 per cent Cr_2O_3) of chrome ore and concentrate, and 7,000 tons more was used in furnace repairs. Producers of chemicals used 131,000 tons with an average Cr_2O_3 content of 45.6 per cent.

Production of chromium ferro-alloys and metal during 1958 totalled 313,000 s.tons, being a drop of 37 per cent from the previous year. Production of chromium chemicals amounted to 97,000 s.tons, sodium bichromate equivalent.

At the end of the year producers' stocks of chromium ferro-alloys and metal totalled 67,000 s.tons, and consumers' stocks were 26,000, the corresponding figures for December 31, 1957, being 74,000 and 24,000. Producers' stocks of chromium chemicals totalled 11,000 tons, sodium bichromate equivalent, against 14,000 tons at the end of 1957.

Imports of chromite and concentrates into the United States during 1958 fell 39 per cent to 1,381,484 tons compared with 1957, which was the peak year for chromite imports.

Towards the end of the year, the demand for chrome ore showed signs of picking up, particularly in the United States, but consuming countries were still well stocked. As stated in our last week's issue, prospects for any immediate revival of buying interest are not very encouraging. However, the recovery in the United States and the rising production of stainless steels should give a renewed impetus to the demand for chromite, which is likely to be further assisted by the growing demand for high-temperature materials.

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The Ferroalloy Association has announced that Japan's output of ferrochrome for March, 1959, totalled 3,073 tonnes, representing an increase of about 47 per cent over the previous month. Japanese ferro-alloy makers are reported to be raising their production level, thanks to ample hydro-electric power supplies. This resulted in a sharply increased output in March of ferro-alloy products, totalling 28,760 tonnes, against the February production of 11,706 tonnes.

The Showa Denko Co., a leading Japanese ferro-chrome maker, has stated that it is negotiating with the Soviet Union to import about 5,000 tonnes of chrome ore from that country. According to local trade sources, the import prices of Russian 48 per cent ore would be about $U.S.34 per tonne, c.i.f. Japan.

ITALY'S QUICKSILVER POLICY

Rumours of a more flexible Italian quicksilver selling policy are circulating in London, but what form the new policy, if implemented, will take, is not known. Possibly it may herald a greater flexibility in the granting of discounts for quantity lots already in force or the basing of the Italian origin price on the prevailing London ex-warehouse price. For the past few days the latter quotation has stood at £79 per flask, which in theory means about £78 f.o.b.

For some months Italy has stuck to a base price of £80 f.o.b. with discounts for quantity lots, as has also Spain. Stocks in Italy have been mounting steadily for some time and now are variously estimated to be between 70,000 and 90,000 flasks. In the event of Italy adopting a more realistic sales policy, it remains to be seen whether her stocks will be reduced to more manageable proportions. Also of the greatest interest will be Spain's reaction to any change in Italy's selling policy.

Indicative of the difficulties under which Italian mercury producers have been labouring is Monte Amiata's net loss of 170,498,936 lire in 1958, which compares with a net profit of 312,600,000 lire in the preceding year. In the company's annual report, it was stated that exports dwindled last year to only 11,400 flasks, this being the lowest figure for 40 years and about half that for 1957. In the balance sheet the item mercury and cinnabar stocks is valued at 3,299,501,325 lire, compared with 1,671,862,625 lire.

Attention is drawn in the report to the draft Bill tabled in Parliament last year for the suspension of the manufacturing tax for a period of two years. This Bill has not yet been approved. The company claims that the tax should be completely abolished instead of being suspended.

The report also states that the Morone and Abbadia San Salvatore refining plants have been equipped with two new Could rotary furnaces which are now in working order.

GERMANY'S LITHIUM PURCHASE

The Canadian company, Montgary Exploration, is reported to have sold a 3,000-ton sample of high-grade lithium ore to Metallgesellschaft, of Frankfurt, Germany. The sample consignment consists of amblygonite averaging 7 to 9 per cent. The German company and W. R. Grace, of New York, are to act as exclusive world-wide sales agents for all Montgary products.

Exploration on Montgary's Bernic Lake property in Manitoba, together with additional drilling by the American Metal Co. (now American Metal Climax), has indicated over 9,000,000 tons averaging 2.14 per cent lithium oxide. The chief lithium-bearing mineral is spodumene, but interesting quantities of pollucite, lepidolite, amblygonite, and beryl, are also present.

An occurrence of pollucite (a caesium mineral) in the spodumene at Bernic Lake is believed to be one of the largest known deposits of this material. Caesium is the most reactive of the alkaline metals and is used in specialized manufacturing processes such as specialty glass, in photo cells used in automatic controls, and in chemical processes, in vacuum tubes and in X-ray equipment. A potentially important use for caesium is as the ion source for ion stream rocket engines. Hitherto, the world's suply of caesium has amounted to only a few hundred pounds a year. The largest producer of caesium compound' is American Potash and Chemical Corporation, which obtains them from a mixed potassium-rubidium-caesium carbonate recovered from alkali-rich end liquors at a lithium hydroxide plant at San Antonio, Texas.

BELGIUM'S WOLFRAM PURCHASE

A substantial quantity of wolfram ore was recently purchased by Belgium, the amount involved being mentioned as from 200 to possibly more than 400 tons. This purchase is believed to have resulted from the placing of a large order by West Germany in Belgium for tungsten carbide. Shipments will be made over several months.

Although the ore price still remains unchanged at from 84s. to 89s. per l.ton unit c.i.f. Europe, the tone of the market seems to be decidedly better than for some time. During the past two months there has been a steady demand for wolfram, both in Europe and the United States. So far orders have been met by material which was already "in the pipeline" in February when the downward movement in prices was arrested. This situation cannot last much longer, and once dealers begin selling metal bought after the price had levelled out, they may well be inclined to hold out for better offers. In these circumstances a return to the price level of 95s. to 100s. ruling at the end of last year seems by no means impossible.

Also noteworthy in this connection is the fact that in recent weeks only small quantities of metal have been coming from Bolivia and Korea, whose persistent offerings were formerly an important factor in depressing prices. It is believed that producers in both these countries are now stockpiling, presumably in the hope that higher prices will not be long delayed.

U.S. PLATINUM SALES

Consumption of platinum-group metals in the United States in 1958, as indicated by sales to consuming industries, declined last year by 10 per cent to about 620,000 oz., according to the Bureau of Mines, U.S. Department of the Interior. Sales of platinum decreased 28 per cent to 236,463 oz., but palladium sales rose 8 per cent to 355,306 oz., while combined sales of iridium, osmium, rhodium, and ruthenium increased 3 per cent to 28,128 oz.

Imports of platinum-group metals in 1958 fell by 2 per cent to 670,431 oz. from 686,983 oz. They included 40,481 oz. of unrefined materials against 33,180 oz. previously.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

Prices during the week have shown little change and no real trends have developed, as ideas vary widely on the probable course of prices in the near future.

COPPER'S WEAKER UNDERTONE

Although the copper market was strengthened by the announcement from Washington that no release of copper was contemplated at the moment, prices have not responded vigorously, as a number of people consider that this statement did not preclude release of copper should prices start to rise sharply. The consumption picture is also chequered as better tendencies in America are being counteracted by stability or, as it seems to some, decline elsewhere.

The figures issued by the Copper Association for March show that domestic consumption of copper by brass and wire mills and foundries, based on their shipments of fabricated products, totalled 136,890 s.tons, an increase of some 20,000 tons over the February figure. In addition, new business booked in terms of refined copper totalled 165,324 s.tons as opposed to only 126,980 tons in February.

On the continent of Europe markets are very slack and new sales difficult to make, but it has to be realized that consumption continues at a high level based on long-term contracts made at a time when there was more optimism in the air. They are, therefore, in tonnage probably ample to cover existing requirements without the addition of marginal purchases. The London market has been less active but with a further 175 tons added to the stocks in official warehouses, the contango is tending to widen.

The price structure in the rest of the world remains unchanged although in America custom smelters have made slight alterations in the buying price of No. 2 copper scrap. It would appear, however, that their selling price of electrolytic wire bars is unlikely to alter from the present level of 32½ c. per lb. unless some radical change takes place in the supply or demand situation.

TIN-IN-WAREHOUSE DECLINES FURTHER

The tin market continues to present a firm undertone with slightly better prices ruling in Singapore and a steadier demand from both Europe and America. The price has remained fairly stationary and offerings of nearby metal indicate that the buffer stock manager may be selling metal on the London market. Stocks in official warehouses again declined by 472 tons and now total only 8,733 tons. As the majority of this must be in the hands of the buffer stock, a very tight position could develop if a demand for nearby metal suddenly arose.

The International Tin Council has issued a review of events during 1958, and the following figures give a condensed picture of the main trends. Restrictions on export by the producer members of the International Tin Agreement continued throughout 1958 with a total permissible export from December 15, 1957, to March 30, 1958, of 27,000 tons, from April 1 to September 30, 23,000 tons, and from October 1 to December 31, 20,000 tons.

Mine production in these countries dropped 31.4 per cent from 152,236 tons in 1957 to 104,508 tons in 1958 : mine production in other countries, excluding the Russian and Chinese *blocs*, remained practically unchanged from the previous year at 10,700 tons. World production of primary tin metal fell by 23 per cent from 158,000 in 1957 to 123,000 in 1958.

Consumption of primary metal fell from 144,500 tons in 1957 to 139,000 tons in 1958 but it is noted that the rate of decline appeared to have been halted during the year and there were signs of a reversal in the trend. World stocks of tin-in-concentrates rose from 26,100 tons at the end of 1957 to 28,500 tons at the end of 1958, whilst world stocks of tin metal were estimated at 58,600 tons at the end of 1958, being some 800 tons lower than a year earlier. In this connection it should, however, be noted that it is probable that some of the buffer stocks are not included in the figure. On Thursday morning the Eastern price was equivalent to £811½ per ton c.i.f. Europe.

PRODUCER LEAD-ZINC CUTBACKS

The lead and zinc markets have again shown little tendency to move pending the outcome of the conference now going on in New York. There are numerous people who take the view that nothing will come out of the conference and, therefore, there is no justification for the recent firming up in prices. Against this, however, must be placed the reports of curtailment in production, firstly by the American Smelting and Refining Co., as reported last week, and secondly by the Consolidated Mining and Smelting Co. of Canada, who are curtailing exports of lead by some 15,000 tons a year and of zinc by some 20,000 tons a year commencing from June 1. It can be argued that these are only the beginnings of cutbacks initiated by all the main producers to improve the price situation and to eventually enable a relaxation in the American quota system.

The majority of members of the trade would definitely prefer some such action by producers, rather than that governments should become mixed up in the lead and zinc trades more than they are today. Reports on consumption follow the same pattern as for copper, although in the United States there are still complaints that the motor car industry is not buying the expected tonnages of high-grade metal.

Closing prices are as follows :

	April 23 *Buyers*	*Sellers*	April 30 *Buyers*	*Sellers*
COPPER				
Cash	£235¾	£236	£234½	£234¾
Three months	£236½	£236¾	£235½	£235¾
Settlement	£236		£234¾	
Week's turnover	10,250 tons		11,925 tons	
LEAD				
Current ½ month	£70½	£70¾	£69¾	£69½
Three months	£71¾	£72	£70¼	£70⅜
Week's turnover	7,650 tons		9,625 tons	
TIN				
Cash	£782	£783	£783½	£784
Three months	£783	£783½	£784	£784½
Settlement	£783		£784	
Week's turnover	920 tons		930 tons	
ZINC				
Current ½ month	£73⅞	£74	£74⅛	£74⅛
Three months	£73½	£73¾	£73⅝	£73⅞
Week's turnover	4,600 tons		8,650 tons	

LONDON METAL AND ORE PRICES, APRIL 30, 1959

METAL PRICES

Aluminium, 99.5%, £180 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £190 per ton
Crude (70%) £190 per ton
Ore (60%) bases 19s. 6d./20s. 6d. nom. per unit, c.i.f.

Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 9s. 0d. lb.
Cerium (99%) net, £16 0s. lb. delivered U.K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 14s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram.
Gold, 249s. 3½d.
Iridium, £23/£25 oz. nom.
Lanthanum (98/99%) 15s. per gram.
Manganese Metal (96% - 98%) £245/£250
Magnesium, 2s. 3d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £21/£23 oz. nom.
Osmiridium, nom.
Palladium, £6 10s./£7 10s.
Platinum U.K. and Empire Refined £28 10s. oz
Imported £26/£27
Quicksilver, £79 ex-warehouse
Rhodium, £41/£45 oz.
Ruthenium, £18/£20 oz. nom.
Selenium, 50s. 0d. per lb.
Silver, 79½d. f. oz. spot and 78½d. f'd
Tellurium, 15s./16s. lb.

ORES AND OXIDES

Bismuth			65% 8s. 6d. lb. c.i.f.
			18/20% 1s. 3d. lb. c.i.f.
Chrome Ore—			
Rhodesian Metallurgical (semifriable) 48%	(Ratio 3 : 1)		£15 15s. 0d. per ton c.i.f.
" Hard Lumpy 45%	(Ratio 3 : 1)		£15 10s. 0d. per ton c.i.f.
" Refractory 40%			£11 0s. 0d. per ton c.i.f.
" Smalls 44%	(Ratio 3 : 1)		£14 0s. 0d. per ton c.i.f.
Baluchistan 48%	(Ratio 3 : 1)		£11 15s. 0d. per ton f.o.b.
Columbite, 65% combined oxides, high grade			nom.
Fluorspar—			
Acid Grade, Flotated Material			£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF_2)			156s. 0d. ex works
Lithium Ore—			
Petalite min. 3½% Li_2O			40s. 0d./45s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O			40s. 0d./45s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O			£25 0s. per ton f.o.b. Beira
Magnesite, ground calcined			£28 0s./£30 0s. d/d
Magnesite Raw (ground)			£21 0s./£23 0s. d/d
Manganese Ore Indian—			
Europe (46% - 48%) basis 57s. 6d. freight			nom.
Manganese Ore (43% - 45%)			nom.
Manganese Ore (38% - 40%)			nom.
Molybdenite (85%) basis			8s. 11d. per lb. (f.o.b.)
Titanium Ore—			
Rutile 95/97% TiO_2 (prompt delivery)			£31/£33 per ton c.i.f. Aust'n.
Ilmenite 52/54% TiO_2			£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)			84s. 0d./89s. 0d. per unit c.i.f.
Vanadium—			
Fused oxide 95% V_2O_5			8s./8s. 11d. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) 65 -66% ZrO_2)			£16 10s. ton c.i.f.

Mining Finance

Union Corporation-Chartered Tie-up

In a news-packed week the most intriguing announcement has been that from the British South Africa Co., or Chartered as it is usually called, and Union Corporation, giving details of a share exchange between the two concerns. Union Corporation proposes to issue 700,000 of its 2s. 6d. Ordinary shares to a subsidiary investment holding company of Chartered. In its turn Chartered is to issue 455,000 of its 15s. shares to a subsidiary of Union Corporation. The market values of the respective share parcels are much the same, that of Union Corporation being worth £1,960,000 at 56s. and of Chartered worth £1,979,250 at 87s.

The opinion is given by the directors of both companies that the proposal will be "to the mutual advantage of the two groups". But the approval of shareholders is to be sought at meetings to be called shortly when a good deal more information will no doubt be given about the ideas behind the scheme which will raise Union Corporation's issued capital to £1,250,000 and that of Chartered to £13,482,003. For Union Corporation the deal will broaden the company's portfolio to include a useful stake in the Rhodesian copper industry and in the widely spread investment portfolio that Chartered is rapidly building up against 1986, the year when its royalty rights in Northern Rhodesia's base metal production will pass to the government of that country without compensation.

NEW KINROSS MINES

For Chartered, the holdings in Union Corporation will expand the investment portfolio to include a substantial stake in South African gold including the flourishing St. Helena mine and the new gold field in the Kinross area where Winkelhaak, the first mine, is now producing. In the Union Corporation annual report just issued it is stated that application is shortly to be made to the South African Mining Leases Board for two new Kinross mining leases, while a further possible lease is still under investigation and more drilling in the area is being done. This confirms the long-held impression that there will be something like four mines eventually in this new field which lies well to the east of the old Far East Rand. It is presumably now possible that Chartered will be offered a participation in the next flotation here on ground floor terms. It may be recalled that although the Winkelhaak 10s. shares were originally allocated at par they were offered to the public at a premium of 50 per cent, i.e., at 15s. They are now 22s., so they have already been a money spinner for the original subscribers.

Union Corporation's consolidated net profit for 1958 was up by £325,526 at £1,903,957. As already announced, the dividend is repeated at 3s., but is added to on this occasion by a bonus of 6d. declared on account of no specific period in order not to attract additional U.K. profits tax liability. Along with Johannesburg Consolidated, Union Corporation is in the unfortunate position of being taxed in the U.K. as well as in South Africa. No doubt with the Kinross field in mind, the allocation to exploration reserve has been stepped up by £50,000 to £350,000. The expenses of £32,802 incurred in connection with last year's note issue are written off. The dividend and bonus absorb £935,812. It is thus clear that with some of the corporation's base metal interests now doing better and with the prospect of expanding revenue from South African gold, there should be a good chance of the dividend for 1959 being at least repeated on the higher capital. On this basis, Union Corporation at 56s. would yield 6¼ per cent, which is quite a reasonable return for a company of this standing which should have further dividend advances in store in due course.

LONDON MARKET HIGHLIGHTS

At the beginning of the week it looked as though the South African gold share market was about to embark on one of its periodic upswings. The stage seemed to be set by the week-end publicity given to calls made in Washington for a higher gold price. But apart from an occasional improvement in shares of the older gold mines, the gold price talk was soon forgotten and the market developed no decided trend.

Even so, there were still a fair sprinkling of market features to provide plenty of interest. Probably the strongest of these was the jump of 2s. 9d. to 65s. 3d. in Hartebeest, which followed a Cape demand inspired by the good yield and high earnings potential of this vigorous mine. Less obvious was the Johannesburg buying of Loraine (30s. 9d.). This centre also bid for Middle Wits (22s. 6d.) from time to time, while London inquiry helped Vaal Reefs to improve to 39s. 9d. on the theory that the merits of this mine had not been fully appreciated. Randfontein, on the other hand, eased to 22s. 6d. when in the annual report the chairman drew attention to his company's rising tax bill.

A certain amount of "I told you so" was heard in Throgmorton Street, when rumours long current were confirmed officially by an announcement that drilling was to be resumed on Farm Video 305. Ever since 1945 it has been known that this farm and the neighbouring Vermeulenskraal Noord 480 lying between President Brand and Harmony mines in the O.F.S. were underlain by the gold- and uranium-carrying Basal reef. Partners in the area are Eastern Rand Extensions (50 per cent), Lydenburg Platinum (25 per cent), and General Mining (25 per cent). Market reaction was to lift E.R. Ext. to 32s. 6d. New Pioneer hardened in sympathy to 32s. 6d.

Much stronger hopes of a new mine, this time in the Kinross area of the Far Eastern Rand, were behind the buying of Union Corporation (56s. 9d.). This finance house has already established the Winkelhaak mine here and at least one successor is expected to make its appearance soon. Also interested in the area are Henderson's, which jumped to 11s. 6d., but the rise was probably more connected with anticipations of the increased dividend. Vaguer hopes of a new flotation lifted "Freddies" to 10s. with the feeling growing that something positive should soon emerge from the drilling activities taking place south of the Vaal river.

Coppers held steady enough, although there was some selling of Messina options (65s.) by holders who do not want to put up 40s. call money for the shares, due between May 1 and July 31. They may well be missing a good investment opportunity. Chartered (87s. 6d.) showed no obvious reaction to their reserve share deal with Union Corporation.

Lead-zincs were depressed by the bearish views being currently expressed on the immediate future of the twin metals. But tins continued to edge higher. Geevor spurted 2s. 10½d. to 23s. following the repayment and capital write-up proposals.

Central Provinces Manganese felt the chill of last year's low world steel production. News of the halved gross profits and lowered distribution caused the shares to drop 2s. 7½d. to 29s. 9d.

Elsewhere, Ashanti were quoted ex the one-for-three scrip issue. The resulting price of 15s. 9d. thus puts the shares on a generous yield basis of 12.7 per cent.

PROMISE OF BETTER INCO EARNINGS

The circumstances of the sharp recession in nickel sales from late 1957 through to the beginning of this year will be familiar enough to *Mining Journal* readers, as will the parallel falling off in earnings of the International Nickel Co. discussed in this column in our issue of March 20. Quarterly earnings, which previously had been running at a level of about $1.50 per share, fell in the last quarter of 1957 to $1.38 and receded progressively from there to 61 c. in the third quarter of 1958, subsequently showing a slight improvement in the final quarter at 64 c.

Nickel sales have, of course, been considerably better during the early months of this year, partly as a result of the gradual revival in American business but still more because of the high activity in the steel industry whose consumers have been stocking up as a hedge against possible mid-summer strikes. Against this background it is encouraging, although scarcely surprising, to learn from Dr. John F. Thompson's address to Inco shareholders (see page 476) that net earnings for the first quarter of 1959 are expected to be better than they were in the corresponding period a year ago, when they amounted to 83 c. per share.

Dr. Thompson rightly points out that in so far as this improvement is attributable to restocking, the benefit from a higher activity in the steel industry may not be sustained. On the other hand, the fact that he attributes part of the improvement to better copper prices and a recovery in platinum sales is an important reminder of how broadly based

is Inco's business. Few companies, if any, have succeeded in making their by-product metals work harder in contributing to total profits, and it is notable that the chairman refers to research on which the company has, with others, been engaged during 1958 into uses for cobalt, selenium and tellurium. The case of cobalt is, of course, particularly urgent for this company no less than for the big African producers.

With the lead-zinc conferences about to start in New York, Dr. Thompson was, no doubt, addressing a wider audience than that of his shareholders in condemning the United States' unnecessary restrictive tariffs. The 1¼ c. per lb. on nickel and 1.7 c. per lb. on copper are not only harmful to Inco and all other producers outside the U.S. They are also forcing up production costs within the U.S. itself at a time when that country is already pricing herself out of the world market.

VAAL REEFS' DIVIDEND CHECK

Vaal Reefs is undoubtedly a promising mine in the Klerksdorp area group of gold and uranium producers, but from a market viewpoint it looks as though there may be a pause in the shares for a year or two. The trouble is heavy capital expenditure. The total cost of the new No. 2 shaft system, including an extension in the plant capacity to 125,000 tons monthly, is put by the chairman, Mr. John Shilling, in the 1958 annual report at £5,600,000. It has been decided to finance this from profits over a period of years, and "it is hoped that it will prove possible for dividends to be maintained at about the present level during the new shaft-sinking phase". The No. 2 shaft system is expected to be completed by the end of 1961, and equipped and brought into operation some time in the following year.

This seems to mean that Vaal Reefs must be valued on the basis of the 3s. 6d. paid for each of the past two years until at the earliest 1962. It explains the stickiness of the shares in recent months despite the fact that earnings have been running at the rate of 7s. 2d. per 5s. share per annum. The present price is 39s. 6d. to yield 8.8 per cent. The long-term potentialities, of course, remain.

The chairman's statement appears on page 478 together with those for Western Reefs and Western Deep Levels.

HOPE FOR RANDFONTEIN?

In his annual statement Mr. D. A. B. Watson, chairman of Randfontein, largely confirms the theories put forward here a fortnight ago regarding this mine's uranium possibilities when the government contract finishes at the end of 1964. He says that the development programme needed to open up the uranium reefs has so far been a burden on working costs. The uranium-bearing Bird reefs are also steeply dipping and heavily faulted in the upper levels. It is hoped that improved conditions in the lower levels will, in due course, have a beneficial effect on costs.

In addition, in the post-contract period it will probably be possible, Mr. Watson says, by milling at a lower rate and by selective mining of the then remaining ore reserves, to increase the grade of ore milled for both uranium and gold should this be necessary. His conclusion is that the cost of producing uranium should thus be brought "within the range of what appear at the present time to be competitive world prices". Mr. Watson adds the rider that it is not, of course, possible to forecast what world prices for uranium will be at the end of 1964.

Here then is a hope that Randfontein with its high uranium costs of 75s. 3d. per lb. in the March quarter compared with only 17s. 2d. at Hartebeest, which is at the other end of the South African scale, will be able to compete in whatever uranium scramble develops in the mid-sixties. In the meantime, the company is handicapped by two factors. Firstly, its expansion plans for uranium production were brought to a halt last year by the overall ceiling imposed on South Africa's uranium tonnage by the purchaser, that is, the Combined Development Agency. So Randfontein's profits from uranium this year are likely to be much the same as in 1958. Secondly, the diminution in the unredeemed balance of capital expenditure as a tax offset means that there is increasing liability in this respect. Thus in 1958 tax at £496,000 was £170,000 higher than in the previous year and the 1959 figure may be around £600,000.

This must inevitably reduce distributable earnings and it would probably be unwise to count on more than 4s. in dividends this year from Randfontein against 4s. 3d. last year and 4s. 6d. in 1957. The £1 shares are now 22s. 6d.—a far cry from the boom peaks of over 70s. in 1953-55. At this stage in the proceedings, holders may well decide that it is best to retain their shares. There is still some life in this uranium mine and even at this late stage in its career any higher gold price might do some good. Also, there is always the eventual question of what may be distributed during the company's final break-up. The distribution could be quite substantial and such a break-up could conceivably start to happen in 1965 if the market for uranium is not then a favourable one for the mine.

Mr. Watson's annual statement to Randfontein shareholders as well as to those of East Champ d'Or and Government G.M.A. appear on page 481.

ARISTON'S PENDING NEW ISSUE

Mr. C. J. Burns, chairman of Ariston Gold Mines, the Ghana producer in the Western Selection group, sprung a surprise in the annual report for the year to September 30 last, when he foreshadowed a new share issue "on favourable bonus terms" designed to raise about £200,000 to finance a programme of opening up the mine down to the 30th level and beyond. It is essential, he says, that hoisting from the 30th level should start by the end of 1959 in order to maintain the annual crushing rate of 480,000 tons. The capital programme is to be spread over three years with completion scheduled for the end of 1961.

Ariston 2s. 6d. stock units were quoted at 4s. 3d. when the report appeared. The present issued capital is £1,125,000 in 9,000,000 units. An issue of 1,500,000 new shares at, say, 3s. would raise £225,000 and would enable an offer to be made to holders in the ratio of one for six. It would only absorb half the 3,000,000 shares at present held in reserve. This is, of course, only guesswork. Mr. Burns promises full official details shortly.

The money is needed to sink No. 4 winze down to the 30th level and ultimately to the 40th level. This, apart from facilitating hoisting from the 30th level, should, it is estimated, add nearly 1,500,000 tons to the present ore reserves from accelerated development between the 25th and 30th levels. Assuming, Mr. Burns goes on, that the value of this extra ore is 6.5 dwt. a ton, then its gold content would be worth over £6,000,000 at 250s. an oz.

FAITH IN GHANA

Ariston certainly looks as though it is opening up well enough to warrant stockholders putting up the modest amount of fresh funds. As regards the political outlook in Ghana, Mr. Burns goes so far as to "state quite categorically that the Ghana Government will do everything in its power to assist mining companies". There is no question, he goes on, of nationalization of the mines in Ghana. On the contrary, the government there looks to a long period of co-operation with the industry during which time Ghanaians can be suitably trained for the more responsible posts within the industry. Mr. Burns winds up on an optimistic note about the gold price. He considers that a major increase in the price from $35 to $50 an oz. "is by no means a pipe dream, but is recognized by responsible world authorities".

The one thing on which no guidance is given are the dividend prospects in the light of the rather complicated situation in this respect. It is to be presumed that Mr. Burns will have something to say about this when the new issue details are published. The position at the moment is that a total of 9d. was paid for 1957-58, but this included a bonus of 3d. The interim for the current year was 3d. against 4½d. a year ago. An indication is needed as to whether a "reasonable" rate of dividends relates to 9d. or 6d. per annum. Even on the latter rate the yield would be as much as 11¼ per cent.

B.P.'s FIFTIETH YEAR

Two points emerge very clearly from the chairman's statement circulated this week to British Petroleum shareholders in advance of the 50th annual meeting on May 21.

In the first place, Sir Neville Gass points out that the producing countries in which B.P. operates—principally Iran, Iraq, Kuwait and Qatar—received between them in 1958 £79,000,000 in tax and £40,000,000 in royalties against which the group's net operating profit after tax and depreciation was £62,000,000. An arrangement whereby the producing country receives £2 for every £1 earned by the oil companies' operating and marketing activities, seems eminently favourable to the former.

The second point which emerges from Sir Neville's statement is that, as the oil industry at least well knows, petroleum products are now very much of a buyer's market. On a realistic view the governments of the producing countries are thus at present in no position to put the squeeze on the oil companies.

It is appropriate in B.P.'s jubilee year to recall the tremendous contribution which this organization has made to the economic betterment of the Middle East and to express the hope that the reasonably moderate outcome of the recent Arab Oil Congress may owe something to this realization.

The chairman's statement appears on page 484.

INTERNATIONAL NICKEL COMPANY OF CANADA

HIGHER NICKEL DEMAND FORECAST

ADEQUATE SUPPLIES ASSURED

CONTINUED WORLD EXPLORATION

The annual meeting of The International Nickel Company of Canada was held on April 29 in Toronto.

Dr. John F. Thompson, the Chairman, who presided, said:

Sharply reduced nickel demand in 1958 forced the Company to operate substantially below capacity during the year. Production was curtailed three times and, for a period of three months, our mines and plants in Ontario were shut down by a labour strike. These conditions, together with lower prices and reduced deliveries of copper and platinum metals, resulted in the lowest earnings for any year since 1949.

Our sales in 1958 totalled $322,000,000, down $120,800,000 from the previous year. Net earnings were $39,600,000, equal to $2.71 per common share, compared with $86,100,000, or $5.90 per share, in 1957. Four quarterly dividends, each of 65 cents per share, totalling $2.60 per share, were paid in 1958, compared with $3.75 per share in each of the three preceding years.

The Company's stocks of nickel rose very rapidly in the first nine months because of lower consumption, heavy inventory liquidation by consumers, and also because we continued to produce at rates above the demand. During the period of the strike, which began on September 24, we were, therefore, able to supply our customers with their full requirements of nickel. The strike was settled on December 22 and production of nickel ready for shipment to market was begun early in January, 1959.

Our deliveries of nickel in all forms in 1958 amounted to 205,800,000 pounds, contrasted with 290,100,000 pounds in 1957. Refined copper deliveries were 210,600,000 pounds, against 280,800,000 pounds in the previous year.

Construction work continued on schedule at the Company's new mining project at Thompson, Manitoba, which is scheduled to start operations next year and to come into full-scale nickel production at an annual rate of 75,000,000 pounds in 1961.

Nickel

Abundant supplies of nickel throughout the free world for both civilian and military purposes, as well as vigorous development work on new markets, characterized the nickel industry during 1958. Total nickel consumption in the free world was approximately 320,000,000 pounds, the lowest since 1954, compared with a record 415,000,000 pounds in 1957. The principal causes of the decrease were a business recession, mainly in the United States, which had a pronounced effect upon the production of durable goods, and a further decline in consumption of nickel for defence requirements. Because of heavy inventory liquidation by consumers, nickel deliveries were substantially lower than actual consumption. Demand was down also in Canada and the United Kingdom, but held up well on the Continent.

Natural Gas

Earlier this month we started using natural gas instead of oil as a fuel in the multi-hearth concentrate roasters in the Copper Cliff, Ontario, smelter. This is the first step in the substitution of natural gas for oil in a number of the Company's metallurgical operations at Copper Cliff, and is an example of the economies and improvements we are constantly effecting. Long-term studies of the potential use of natural gas in these operations resulted in arrangements making provision for delivery to us of up to 10,000,000 cubic feet per day of this fuel now made available by the recently completed pipeline from western Canada.

Inflation, Costs and Prices

One of the most serious situations confronting all of us is the inflation arising from a number of causes. This is not the place for a broad discussion of this subject, but we all recognize that overexpenditures by governments with accompanying excessive taxation plus unrestrained demands for wage increases can only result in higher costs and higher prices. Your Company has endeavoured to keep its nickel prices in line, only raising them in an amount consistent with rising costs. In this connection, I should like to point out that the wage increase recently made effective following the settlement of the strike at our Ontario mines and plants did not result in an increase in our price for nickel. It is to be hoped that restraint will be shown, particularly by the major unions and major companies, in the various labour negotiations scheduled this year.

Manitoba Project

Underground development and construction of surface and town facilities at Thompson, Manitoba, are proceeding on schedule. Favourable results in the exploration of the ore bodies revealed that the Thompson Mine would be capable of meeting the planned objective of the Manitoba project of 75,000,000 pounds of nickel annually. This made it advisable to postpone work at the nearby Moak Mine and concentrate on the rapid development at Thompson. The railroad grade from Thompson to Moak Mine, however, was completed, but track installation is being deferred. This right-of-way for a future railroad is being used as a truck road to service the area's exploration camp which is located at Moak Lake.

The Manitoba project, which is being financed from Company funds and without any government subsidy or government guarantee of a market, will be the world's second largest source of nickel, exceeded only by the Inco operations in the Sudbury District of Ontario.

In the 29 months since active development work has been under way, the Company has expended in excess of $60,000,000 on this project and, in addition, it has advanced $20,000,000 to The Manitoba Hydro-Electric Board to assist in financing the development of power facilities in the area. Expenditures by the Company for the Manitoba project for the balance of the year are estimated at over $30,000,000.

It has now been decided to construct an electrolytic nickel refinery at Thompson with a capacity of up to 75,000,000 pounds of nickel per year, the initially scheduled capacity of the Manitoba project. In the original programme, decision on the process to be used was deferred until completion of experimental studies. These studies have led us to the decision that electro-refining would be the most suitable and economical procedure. In making arrangements for electric power, the Company included refining in its estimated requirements from the Kelsey hydro-electric plant being built by The Manitoba Hydro-Electric Board on the Nelson River, 53 miles from Thompson.

The refining process to be employed was developed by research scientists and engineers of the Company. Its suitability has been demonstrated by commercial operation since December, 1956, in a section of our nickel refinery at Port Colborne, Ontario. A main feature of the process is the direct electrolysis of nickel matte, which eliminates high-temperature oxidation and reduction operations. Nickel sulphide of low copper content from Bessemer converters will be cast directly into sulphide anodes and electrolyzed for the production of high-quality nickel.

I cannot emphasize too strongly the long-range importance of the Manitoba project to the Company and to the nickel industry in general. Consumers of nickel must be assured of plentiful supplies in the years ahead if the full market potential of the metal is to be realized. Nickel production capacity must be capable of meeting surges in demand that will arise during the anticipated upward trend in nickel consumption. The prompt completion of our Manitoba project, which will increase the Company's total annual nickel production capacity to 385,000,000 pounds beginning in 1961, will contribute greatly to the attainment of this goal. But we set no ceiling on the demand that can be created for nickel and we must do whatever is necessary to assure that future supplies will always be more than adequate. As a consequence, we are actively continuing our exploration in Canada and throughout the world for still further sources of nickel.

Market Development

The Company's market development efforts in the field of nickel uses were further intensified in 1958. Assured nickel supplies made it possible to place greater emphasis on the commercial development of past research achievements and to shorten the time between laboratory findings and their use in market expansion.

Steps were also taken toward substantially increasing research, both for basic knowledge in our field and for specific technical developments, designed to protect and expand existing markets or develop new ones.

We continued to sponsor projects in outside laboratories to supplement our own work and to co-operate closely with steel producers and other nickel consumers in development of new and improved nickel-containing products. The Company, along with other metal mining companies, participated in the support of sponsored research on uses of cobalt, selenium and tellurium, by-products of its Canadian operations. During 1958 it also joined with other major North American copper producers in initial steps leading to the development of a programme to broaden and increase the market for copper. This supplements the work which has been carried on for many years by the Copper Development Association in Great Britain, of which our United Kingdom affiliate, The Mond Nickel Company, Limited, has been a member since its inception.

Foreign Exchange

During the year the average rate of exchange for the Canadian dollar was approximately $1.03 (U.S.) as compared with an average of about $1.04¼ in 1957. Accordingly, we realized during 1958 about 1¼ per cent more on our conversions of United States dollars into Canadian dollars than we would have in 1957.

At the close of the year the Bank of England announced that all sterling owned by non-residents of the sterling area arising from commercial transactions would be freely convertible. Similar announcements by the leading countries in Continental Western Europe relating to the convertibility of their currencies were made at the same time. These measures further removing restrictions on currencies are welcome steps in the liberalization of world trade.

Common Market

The European "Common Market" (European Economic Community), which I mentioned at this Meeting a year ago, began to operate on January 1, 1959, when a treaty became effective through which France, West Germany, Italy, Belgium, the Netherlands and Luxembourg agreed to abolish all internal customs barriers within the next 14 years, and to permit the free flow of labour and capital which, together with equalization of industrial conditions, wages, etc., will tend to build the six nations into an industrial and perhaps, in time, a political unit.

As a result of this treaty there have been many significant developments in these countries. That these will have a profound effect both on the size and the geographical distribution of the nickel market on the Continent is certain. There has also been an accelerated movement by many companies, chiefly from the United States, to establish branches and factories inside the area, or to combine with established European companies so as to obtain the advantage of operating within the framework of the Community.

We have no manufacturing facilities of our own within the European Economic Community, but many of the largest consumers in that area have been users of Inco's nickel for about 60 years, with all the friendly commercial relationships that this implies. Over 30 years ago we established four Nickel Information Bureaux in this area to supply technical information concerning nickel and further the expansion of the nickel market. These Bureaux are staffed by nationals of their respective countries. They function through personal contacts and participation in the work of technical societies. Their activities are supplemented by distribution to a large and carefully selected technical audience of technical information and periodicals published in the languages of the areas in which they circulate.

While the establishing of the European Economic Community will result in a general liberalization of commercial relationships inside the six countries, there is the possibility that they might maintain a common tariff wall against manufactured products from the rest of the world with resulting general deleterious effects on the world's trade. Your Company feels that the interests of all concerned are best served by a free flow of materials across national borders unencumbered by tariffs or quotas. Two examples of unnecessary restrictive tariffs, both of which work to the detriment of Canada, are the United States tariffs of 1¼ cents per pound on refined nickel and 1.7 cents per pound on refined copper. Both tariffs, while especially harmful to Canadian exports of these metals to the United States, are also harmful to consumers in that country who are thereby denied, to that extent, full access to a geographically natural source of supply.

The Government of the United Kingdom is consulting other governments with the aim of establishing a system of economic co-operation, embracing the six Common Market countries and 11 other European countries now outside the Common Market, designed to expand and maintain the free-trade principles of the Organization for European Economic Co-operation without its political implications.

Directors

The Hon. J. Kenneth Weir, C.B.E., Chairman of G. & J. Weir Holdings Limited, and G. & J. Weir, Limited, of Glasgow, Scotland, was elected a Director and member of the Advisory Committee of the Company on February 2, 1959. He succeeded his father, The Rt. Hon. Viscount Weir, P.C., G.C.B., who resigned after distinguished service as a Director since 1928. Lord Weir has been extended the emeritus title of Honorary Director of the Company.

Outlook

While figures for first quarter operations of 1959 are incomplete, net earnings for this period are expected to show an improvement over the corresponding quarter a year ago, when they totalled $12,200,000, equal to 83 cents per common share. Contributing factors to the expected improved earnings for the first quarter were a sharp surge in demand for nickel in the United States, higher prices for copper and increased sales of platinum metals. We must bear in mind, however, that some of this was brought about by the building up of inventories by industry as protection against the possibility of labour disturbances this year in basic industries, particularly in the United States.

It is anticipated that the world demand for nickel will continue through 1959 at a rate higher than in 1958. This, together with improved prices for copper and platinum metals, should result in a satisfactory year.

The report and accounts were adopted.

Geological Publications

The first volume of a 1:50.000 scale geological map of Israel, covering the six sections of the Galilee region, has just made its appearance. The mapping was done by eight geologists. The publishers, the Israel Geological Survey, were assisted by members of the Hebrew University's academic staff. The entire map will consist of four to five volumes, and the second volume, covering Mount Carmel, is almost completed. It will be the first map of this country to be executed on a 1:50.000 scale.

Another geological publication in preparation, is the International Stratigraphical Lexicon, being sponsored by the International Geological Congress. It will contain definitions and descriptions of all stratigraphical terms published or used in different countries. The material relating to Israel is now being prepared by a team of ten geologists, among them four Hebrew University teachers and several graduates. The work is being carried out under the auspices of the Israel Geological Survey.

WESTERN REEFS EXPLORATION AND DEVELOPMENT COMPANY, LIMITED

(Incorporated in the Union of South Africa)

HIGHER WORKING PROFIT

The following are extracts from the statement by the chairman, **Mr. John W. Shilling,** which has been circulated with the annual report and accounts:

The total working profit from the production of gold, uranium and sulphuric acid at the company's mine during 1958 was £2,689,541. This was higher, by £20,874, than the total working profit for 1957. A small decrease of £3,267 in the working profit from gold was more than offset by an increase of £24,141 in the working profit from uranium and acid. The net profit carried to the appropriation account was £2,623,483, an increase of £44,172 over that for the previous year. An amount of £100,000 was transferred from the uranium reserve to the appropriation account to assist in meeting the tax and lease payments for the year. This, with the unappropriated profit of £407,212 brought forward from 1957, brought the total standing to the credit of the appropriation account to £3,130,695. Capital expenditure and redemption of uranium loans absorbed £688,488. An amount of £8,000 was appropriated for directors' special remuneration. Dividends absorbed £875,000, equivalent to 2s. 6d. per share. Tax and lease payments amounted to £1,075,789 bringing the total payments to the Government since 1954 to £3,168,106. The unappropriated profit carried forward into 1959 was £483,418. At the end of 1958, the uranium reserve stood at £700,000. Capital expenditure for 1959 is estimated at £212,000.

During the year, 1,334,000 tons of ore were milled. This was less, by 106,500 tons, than the tonnage milled in 1957. The decrease was due, in the main, to a shortage of underground labour at one time during the year and to an increase in the waste sorted on surface. The gold yield increased, however, by 0.36 dwt. to 4.79 dwt. per ton milled following the improvement in the rate of sorting and an increase in the proportion of tonnage mined on the Vaal Reef horizon. In the result, as already mentioned, the profit from gold was only slightly less than that for the previous year. The increase in the profit from uranium is a reflection of an improvement in the yield per ton treated and a higher profit margin.

Development

A total of 79,804 feet was developed in 1958 in the existing lease area, the Goedgenoeg section and the Nooitgedacht prospect. This was lower, by 10,174 feet, than the footage accomplished last year. The footage sampled, at 39,750 feet, was about the same. The percentage payable increased slightly, but there was a drop in the gold and uranium values compared with 1957. As the Goedgenoeg section can now be regarded as part of the mine, the results of development in this section have been included in those for the lease area. At the end of 1958 the ore reserve within the extended lease area, on both reef horizons, was 4,305,900 tons with an average value of 6.33 dwt. of gold and 0.538 lb. of uranium per ton. This represented a decrease of 240,100 tons com-

pared with the previous year's reserve, but a slight increase in the gold and uranium values. The ore reserve on the Vaal Reef increased, by 135,700 tons, to 2,199,300 tons. By the end of 1958 the quantity of uranium bearing slimes on the slimes dam had decreased by 1,272,000 tons to 6,657,000 tons with an average value of 0.32 lb. compared with 0.34 lb. per ton at the end of 1957.

Operations in the Nooitgedacht prospect during 1958 were encouraging. A further 323,500 tons of payable ore were disclosed, making a total of 749,100 at the end of the year, with an average value of 6.06 dwt. of gold and 0.220 lb. of uranium per ton. Two boreholes, N.26 and N.27, were sunk from surface at points 4,300 and 2,300 feet, respectively, to the west of the boundary of the existing lease area. In borehole N.26 the Ventersdorp Contact Reef was intersected at a depth of about 2,944 feet. The values obtained were negligible. In borehole N.27 the Ventersdorp Contact Reef was intersected at a depth of about 2,984 feet. The original intersection gave a value of 40 dwt. per ton over a borehole width of five inches. The core was broken and badly ground away. The core from the first deflection was not assayed because of excessive core loss. A second deflection gave a value of 4 dwt. per ton over a borehole width of eight inches. Here the core was slightly broken and ground away. In the circumstances little reliance can be placed on the values obtained. The main purpose of these boreholes was to secure geological information for the determination of the area over which the company should apply for an extension to its lease area and for the layout of underground workings. It is intended to make application shortly for an extension of the lease area.

Work was continued on the delimitation of the payable area of the Vaal Reef ore body. Decreasing values and payability were experienced in the drive from the No. 3 Joint Shaft on the 50 South Level as it approached the vicinity of borehole WK.27. Satisfactory values continued in the 59 South and 65 North Haulages. Interesting values and payability were encountered in development work off the end of the long 62 West Haulage near borehole N.14. In borehole N.18, which was deepened during the year, the Vaal Reef was not intersected owing to faulting. Other boreholes sunk earlier in the northern area will be re-examined during 1959.

In 1958 the Atomic Energy Board introduced a quota system governing the sale of uranium oxide to the Combined Development Agency. The company was given a quota of 338,790 lb. for the second six months of 1958 and has now been given a quota of 677,580 lb. for the full year, 1959. The company's total output of uranium for 1958 was 690,290 lb. The total quantity sold through the Atomic Energy Board was 666,098 lb. This consisted of the company's output for the first six months of 1958 which was sold to the Agency in the usual way, the company's full quota for the second six months and the company's share of a small quantity sold to a purchaser in Japan. The company's excess production of 24,192 lb. was carried forward and will be available for sale in 1959.

The average price realized by the company for uranium sold through the Board during 1958 was 88s. 2d. per lb. The cost of production was 37s. 7d. and the working profit was 50s. 7d. per lb. sold.

I would congratulate the mine, as a whole, on its success in the safety competitions organized by the Chamber of Mines. For a time during 1958 it held the top position in two shield competitions and, up to the middle of December, it achieved the distinction of having worked a total of 1,918,187 shifts without a fatal accident.

VAAL REEFS EXPLORATION AND MINING COMPANY, LIMITED

(Incorporated in the Union of South Africa)

YEAR'S GOOD PROGRESS

The following are extracts from the statement by the chairman, **Mr. John W. Shilling,** which has been circulated with the annual report and accounts for 1958:

During 1958 good progress was made at the company's mine.

Compared with 1957, there was an increase in the tonnage milled, an improvement in the yield of gold per ton milled and an increase in the waste sorted on surface. The yield of uranium per ton treated was fractionally lower, but because a larger tonnage was treated the total quantity of uranium produced was greater. The total footage developed and the reef footage sampled both increased. The percentage payability decreased slightly, however, as did the average gold value. The average uranium value compared favourably with that encountered in development in 1957. There was a satisfactory increase in the ore reserve, but a small decline in the gold and uranium values.

Higher Working Profit

At £3,917,800, the total working profit derived from the production of gold and uranium was higher, by £524,788, than that for 1957. The net profit for the year was £3,840,084. Appropriations of £1,983,119 for capital expenditure, of £8,000 for directors' special remuneration and of £1,837,500 for dividends (representing 3s. 6d. per share), absorbed £3,828,619. The unappropriated balance of £11,465 was carried forward into 1959.

Capital expenditure on shaft sinking, development, buildings and equipment, and on the uranium plant amounted to £1,328,232. The net expenditure on fixed assets for the year was £1,237,765. This, together with £1,420,251 (the excess of expenditure on fixed assets over funds raised at December 31, 1957) and £200,103 (the payment in part redemption of the uranium loans), amounted to £2,858,119. The proceeds of the 500,000 shares subscribed by Anglo American Corporation of South Africa, Limited, provided £875,000, leaving a balance of £1,983,119 which, as mentioned earlier, was appropriated from profits. Capital expenditure for 1959 is estimated at £1,890,000.

The gold reduction plant was extended and now has a rated capacity of 100,000 tons per month. The ability of the mine to make full use of this will depend, in the main, on the available labour supply.

In 1958 the Atomic Energy Board introduced a quota system governing the sale of uranium oxide to the Combined Development Agency. The company was given an Agency sales quota of 285,140 lb. for the second six months of 1958 and has now been given a quota of 570,280 lb. for the full year, 1959. The company's total output of uranium for 1958 was 574,177 lb. The total quantity sold through the Atomic Energy Board was 561,630 lb. This consisted of the company's output for the first six months of 1958, which was sold to the Agency in the usual way, the company's full quota for the second six months and the company's share of a small quantity sold to a purchaser in Japan. The company's excess production of 12,547 lb. was carried forward and will be available for sale in 1959. The average price realized by the company for uranium sold through the Board during 1958 was 78s. 9d. per lb. The cost of production was 20s. 8d. and the working profit 58s. 1d. per lb. sold.

New No. 2 Shaft System

Exploitation of the property is proceeding. Considerable areas have been opened up off the 55 Drive East, the 59 and 65 North Haulages and the 62 West Haulage from No. 1 Shaft system. The 53 South-east Haulage being driven towards the area to be served by the new No. 2 Shaft system has now passed through the Kromdraai fault. The Vaal Reef lying above this haulage on the south side of the fault has been exposed over a short distance and found to carry satisfactory gold and uranium values. Work is proceeding on the 50 East Haulage which is also to be driven towards the site of the No. 2 Shaft. Additional ground has been opened up to the south from the No. 3 Joint Shaft. Further development in this area is contemplated in 1959, depending on the supply of air available to the mine from the Joint Shaft.

The collar and concrete head frame of the main shaft have been constructed. Work on the collar of the ventilation shaft, on the winder house, shaft offices and other buildings is proceeding satisfactorily. Although the twin shafts will be sunk to a depth of about 7,200 feet, it is planned to break away initially with development on levels above the 6,200 foot elevation and to connect up with the development in the area to the south-east of the No. 1 Shaft.

The commissioning of the No. 2 Shaft system will permit the exploitation of this area and a substantial increase in the overall scale of operations. It is expected that the new twin shafts will be completed by the end of 1961 and that the shaft system will be equipped and brought into operation some time in 1962. About the time that the shaft system is commissioned, the capacity of the gold reduction plant will be increased to 125,000 tons per month: later it will be increased to 150,000 tons per month.

The total cost of the No. 2 Shaft system is now estimated at £5,600,000. It is proposed to finance the cost from profits over a period of years and it is hoped that it will prove possible for dividends to be maintained at about the present level during the new shaft sinking phase.

The assessed loss carried forward for tax purposes at December 31, 1958, was estimated at £7,300,000.

WESTERN DEEP LEVELS, LIMITED

(Incorporated in the Union of South Africa)

GOOD PROGRESS REPORTED

Mr. H. F. Oppenheimer's Statement

The following are extracts from the statement by the chairman, **Mr. H. F. Oppenheimer,** which has been circulated with the annual report and accounts.

This company was incorporated on August 6, 1957. At the end of January, 1959, the company offered, for subscription at par, 4,750,000 "A" shares of £1 each. This offer was accompanied by a prospectus which had been published in the Press on January 2, 1959.

On the company's formation, 850,000 "A" shares of £1 each in its share capital were subscribed in cash at par in terms of its flotation agreement. The company was provided with further funds to finance its initial operations by means of a loan of £5,000,000 granted to it by a syndicate formed by Anglo American Corporation of South Africa, Limited in association with certain other companies.

When these funds were exhausted in October, 1958, temporary loan facilities were extended to the company by Anglo American Corporation. The authorized capital was then increased and the 4,750,000 "A" shares of £1 each, to which reference is made earlier, were offered for subscription, in cash, at par, at the end of January, 1959. Ninety-eight per cent of these shares was subscribed in response to the offer, the balance of two per cent being taken up by the underwriters. The temporary borrowings from Anglo American Corporation were repaid out of the funds so raised. The balance of these funds should be sufficient to finance operations until about the end of the third quarter of 1959, when consideration will be given to the question of raising further capital to meet the needs of the company.

Shaft Sinking

Good progress is being made on the property. No. 2 and No. 3 Shaft systems, each consisting of twin hoisting and ventilation shafts, are in the course of being sunk. These shafts will extend to a depth of about 6,300 feet below surface and will provide access to the Ventersdorp Contact Reef, the sub-outcrop of which occurs in the north-western portion of the property at a depth of about 5,000 feet. The sub-vertical shafts will be sunk to a final depth of about 9,700 feet. From these it is intended to work the Carbon Leader Reef which, extending down from the neighbouring Blyvooruitzicht and West Driefontein gold mines, enters the property at its northern boundary at a depth of about 7,000 feet.

By March 31, 1959, the main shaft of the No. 2 Shaft system had reached a depth of 3,018 feet and the ventilation shaft a depth of 2,714 feet. The main and ventilation shafts of the No. 3 Shaft system had been sunk to depths of 3,536 feet and 4,429 feet, respectively. Subject to the current rate of sinking being maintained, the consulting engineers estimate that the Ventersdorp Contact Reef should be intersected at a depth of about 5,720 feet below surface in the No. 2 Main Shaft during the first quarter of 1960. At the No. 3 Shaft system, the Ventersdorp Contact Reef should be intersected at a depth of about 6,420 feet below surface in the sub-vertical shaft. Before then, however, it is hoped to expose this reef in a cross-cut from the No. 3 Vertical Shaft.

In the consulting engineers' report contained in the prospectus mention was made of an arrangement with West Driefontein Gold Mining Company Limited whereby that company would develop a cross-cut on 18 Level from the West Driefontein No. 5 Shaft to intersect the Ventersdorp Contact Reef within this company's mining lease area and to carry out certain development operations on that reef. The purpose of this arrangement was to secure information concerning the value and payability of the Ventersdorp Contact Reef in the company's lease area and geological data that would facilitate planning of the workings on this reef. The arrangement has now been modified and the West Driefontein company will undertake development by winzing on reef from the exposure of Ventersdorp Contact Reef obtained in their 16 Level cross-cut. By making this change, provided the work proceeds normally, it should be possible for the winze on the Ventersdorp Contact Reef to cross the common boundary into this company's lease area and for a certain amount of development on the reef to be accomplished some months earlier than would have been the case under the previous arrangement.

GOVERNMENT GOLD MINING AREAS (MODDERFONTEIN) CONSOLIDATED LIMITED

(Incorporated in the Union of South Africa)

Statement to Members by the Chairman, **Mr. D. A. B. Watson,** on the Directors' Report and Accounts for the year ended December 31, 1958. (Issued to Members prior to the Forty-ninth Annual General Meeting to be held in the Board Room, Consolidated Building, corner of Fox and Harrison Streets, Johannesburg, on Friday, May 8, 1959, at 2.15 p.m.):—

Operations—Gold Mine

Mining operations on the mine continue on the basis of attempting to extract over a period of time the largest possible proportion of the tonnage of payable ore remaining in the mine.

The reduced scale of mining operations established during June, 1957, was maintained throughout 1958, the average milling rate during that year being of the order of 62,000 tons per month. The combined operations of gold mining and treatment of old residues, together with rents and sundry revenue, etc., resulted in marginal profits being earned for the first nine months of the year, but from October onwards losses were incurred. Steps were taken in January, 1959, again to reorganize mining operations on the basis of a reduced milling rate of approximately 50,000 tons per month. During the period of reorganization in January, February and March, further losses were incurred. It is expected that losses will be eliminated during the remaining months of the current year, but it is impossible at this stage to forecast how long mining operations can in fact be profitably continued.

Production — Pyrite

During the year under review a record tonnage of pyrite was produced and sold to the uranium producers of the gold mining industry. The requirements of the uranium producers diminished towards the end of the year with the result that production and sales are expected to be lower this year, with a consequent drop in net revenue. Present indications are, however, that net revenue for 1959 should be of the order of £250,000, after providing for the repayment of and interest on loans raised for this plant.

Pyrite is produced from the treatment of slimes residues arising from gold extraction plant. Notwithstanding the fact that the tonnage of current slimes available for treatment has been reduced, there remains available a considerable tonnage of slimes accumulated from gold mining operations in previous years. These accumulations will of themselves provide more than sufficient material for treatment in the pyrite plant during the period of the present contract for the supply of pyrite to the uranium producers. This terminates in September, 1964.

Funds

The net increase in available funds arising from sales of gold, pyrite, rents and sundry revenue, etc., and the disposal of such plant, stores and materials not required for current operations, and after allowing for taxation and Government Share of Profits amounted to £321,202 for the year 1958. No dividends were paid during the year 1958, but returns of capital were effected, amounting to 1s. per share and absorbing £280,000. A further return of capital amounting to 6d. per share was paid to members registered in the books of the company at the close of business on March 23, 1959, and to persons presenting to the London Secretaries coupon No. 82 detached from share warrants to bearer in circulation on that date.

Sales of assets are proceeding as and when opportunity arises. The attention of members has previously been drawn to the fact that the amount received from these sales will be relatively small as compared with the amount shown in the balance sheet against plant and buildings. This figure reflects the cost of these items and bears little relation to the net amounts likely to be received when they are sold. The major source of the funds which will become available for future distributions to members will be the profits arising from the production of pyrite during the period of the current contract. It is the present intention of the Board of Directors to distribute to members registered at the end of March and September in each year such funds as may be available for distribution at the time. The next distribution will be made to members registered at the end of September, 1959.

The State's share of the profits earned by your company, including the profits derived from the sales of pyrite, is determined by a formula which takes into account the total revenue received from, and the total expenditure upon, the production of gold and pyrite combined. The operation of the formula is such that for a given profit the proportion of the profit retained by the company is diminished as total revenue and total expenditure

diminish. It is therefore to the advantage of the company to continue mining operations and to incur expenditure thereon even at no profit, and mining operations will accordingly be continued for as long as possible during the period of assured pyrite sales under the existing contract with the uranium producers.

For the year 1958 the State's share of profits amounted to approximately 15 per cent. of the working profits. If mining operations continue during the year 1959 at the present levels the State's share of profits is likely to be between 12 per cent. and 14 per cent. for that year.

Pneumoconiosis

The annual levy paid into the Controlled Mines' Compensation Fund during the year ended March 31, 1959, by Group "A" controlled mines amounted to £2,467,500. The levy for the current year has been fixed by the Pneumoconiosis Board at a net amount of £800,000. This substantial reduction in the levy is due in the main to a decrease in the number of new cases of pneumoconiosis and tuberculosis occurring amongst mine employees. Moreover, it is expected that this liability will be reduced further because of a surplus existing in the Controlled Mines' Compensation Fund as disclosed in a recent valuation of the Fund carried out in terms of the Pneumoconiosis Act.

This company's contribution towards the annual levy for the year ended March 31, 1959, was £50,816, which amount was charged to working costs.

In conclusion I would like to record the Board's appreciation of the excellent services rendered by the Manager, Mr. R. J. L. Tarlton, and the employees at the mine, and by the technical and secretarial staffs at the Head Office.
April 28, 1959.

Company News

Simon-Carves Ltd., Stockport, and Bruce Peebles and Co. Ltd., East Pilton, Edinburgh, announce the signing of an agreement for the joint design and supply of electronic-pneumatic and electronic-hydraulic control and interlocking equipment for mine car handling and skip winding plant and other mining applications.

★

British Oil Equipment Credits Ltd., a subsidiary company of the Council of British Manufacturers of Petroleum Equipment, has been registered. It has been formed to promote schemes for the sale on deferred terms to overseas purchasers of capital plant and equipment made in the United Kingdom for the petroleum industry. The new company will shortly endeavour to arrange deferred terms for the supply of British-made equipment for an extension to the Minatitlan Refinery in Mexico, and Mr. G. V. Sims, Director of the Council, leaves for Mexico next week.

★

A private exhibition is being staged by the Mond Nickel Company at the Cutlers Hall, Sheffield, from June 2 to June 5, featuring the properties of nickel, nickel-containing materials, the platinum metals, and S.G. iron. The exhibition is divided into sections dealing with mechanical and physical properties, corrosion resistance, electro-deposition, strength at high temperatures, toughness at sub-zero temperatures, and welding.

THE EAST CHAMP D'OR GOLD MINING COMPANY, LIMITED

(Incorporated in the Union of South Africa)

Statement to Members by the Chairman, **Mr. D. A. B. Watson**, on the Directors' Report and Accounts for the year ended December 31, 1958. (Issued to Members prior to the Forty-first Annual General Meeting to be held in the Board Room, Consolidated Building, Corner of Fox and Harrison Streets, Johannesburg, on Wednesday, May 6, 1959, at 2.15 p.m.) :—

Accounts

The net profit for the year before providing for taxation amounted to £92,874 (1957—£91,331). After allowing for the various items set out in the profit and loss account, including an amount of £29,250 (1957—£26,060) in respect of taxation and £51,975 (1957—£60,637) in respect of dividends, the unappropriated profit carried forward was £24,947 (1957—£18,962).

Operations

Mining operations, although confined to the Bird Reef Series, were not, as in previous years, concentrated entirely upon the Monarch Reef. It was found that a reef lying approximately 20 ft. below the Monarch Reef, locally known as the Footwall Reef, although generally of a lower grade than the Monarch Reef, was in certain areas of the mine payable in respect of its combined uranium and gold content. An appreciable proportion of the development and approximately 26 per cent. of the tonnage mined during the year were on the Footwall Reef horizon. Evidence indicates that ore from this reef will, to some extent, extend the life of the mine as a uranium producer, but it is still doubtful whether operations can be continued for the duration of the uranium contract which expires on December 31, 1964.

The fact that all uranium treatment plants in South Africa are now working on a quota basis does not at this stage affect the scale of operations of this company, for the reasons which are set out in the Directors' Report.

Owing to the recent relaxation of security provisions, it is possible this year to disclose the total price received for uranium oxide produced by this company. This information is given in the Consulting Engineers' report attached to the Report and Accounts.

Unlike most uranium producers where uranium is a by-product of gold mining, the company is a primary producer whose mining operations are directed towards the production of uranium, the gold recovered being a by-product. The cost of production includes therefore not only the cost of the treatment of the ore for uranium but also the cost of mining and milling the ore. The net cost of mining and milling, less the revenue received from gold recovered in this process, was 59s. 4d. per lb. of uranium, while the cost of treatment in the uranium plant at Randfontein Estates was 15s 5d. per lb., making a total direct cost of 74s. 9d. per lb. of uranium produced.

The company's cost of production per lb. of uranium is high even in relation to the costs of other primary producers. The main reason for this is that the recovery grade of uranium at 0.745 lbs. per ton milled is low, compared with that of other primary producers. Another contributory factor is the low gold content of the uranium ore, the recovery being 0.565 dwt. per ton milled; the revenue from this gold, has, of course, the effect of reducing the net cost of production of uranium.

The fact that the cost of production is high is unlikely to be of significance in relation to the post-contract period, as it is anticipated that the tonnage of available uranium ore will by then have been depleted.

Future Operations

Some exploratory work was carried out during the year on the Main Reef Series in the upper levels, which were mined many years ago, for the purpose of examining the possibility of producing, by the reclamation of pillars and remnants, a small monthly tonnage of comparatively high-grade gold ore, which could be milled and treated separately from the uranium ore and which would result in additional profits.

This reclamation has been started in the current year and is proceeding satisfactorily. Owing to the fact that the operations are on a very small scale which is likely to fluctuate widely from month to month, and as they are still in the experimental stage, it was decided that the publication of the results of this work on a monthly basis might be misleading. The results will accordingly be reported quarterly. During the quarter ended March 31, 1959, 3,000 tons were milled at a profit of approximately £1,500. It is hoped gradually to increase the tonnage from this source but it is too early to make any assessment of the significance of these reclamation operations or to determine whether they can profitably be continued.

Members were informed last year that it was becoming increasingly difficult to maintain the grade and that there might be some falling off in profits towards the end of 1958 and in 1959. However, owing to the unexpectedly satisfactory results obtained from the Footwall Reef and to the fact that the reclamation operations on the gold mine are at present producing a small profit, it now appears probable that the total profit for the current year may show some small improvement on the profit for 1958.

Pneumoconiosis

The annual levy paid into the Controlled Mines' Compensation Fund during the year ended March 31, 1959, by Group "A" controlled mines amounted to £2,467,500. The levy for the current year has been fixed by the Pneumoconiosis Board at a net amount of £800,000. This substantial reduction in the levy is due in the main to a decrease in the number of new cases of pneumoconiosis and tuberculosis occurring amongst mine employees. Moreover, it is expected that this liability will be reduced further because of a surplus existing in the Controlled Mines' Compensation Fund as disclosed in a recent valuation of the Fund carried out in terms of the Pneumoconiosis Act.

The company's contribution towards the annual levy for the year ended March 31, 1959, was £9,371, which amount was charged to working costs.

In conclusion I would like to place on record the Board's appreciation of the able and willing services rendered by the Manager, Mr. C. Gordon Davis, and the employees on the mine and the technical and secretarial staffs at the Head Office.
April 28, 1959.

THE RANDFONTEIN ESTATES GOLD MINING COMPANY, WITWATERSRAND, LIMITED

(Incorporated in the Union of South Africa)

Statement to Members by the Chairman, **Mr. D. A. B. Watson,** on the Directors' Report and Accounts for the year ended December 31, 1958. (Issued to Members prior to the Sixty-sixth Annual General Meeting to be held in the Board Room, Consolidated Building, corner of Fox and Harrison Streets, Johannesburg, on Wednesday, May 6, 1959, at 11 a.m.) :—

Accounts

Working profit for the year, after providing for interest on and repayment of uranium loans, was £1,395,499 (1957—£1,321,142). After taking into account sundry items of revenue and expenditure and allowing for transfers to uranium and general reserves, for capital expenditure, for taxation, and for the payment of dividends amounting to £863,505 (1957—£914,300), the undistributed balance at December 31, 1958, was £214,742 (December 31, 1957—£43,877). Transfer from general reserve of an amount of £182,525, representing the decrease in the value of stores and materials on hand at December 31, 1958, was responsible for the improvement in the undistributed balance.

Taxation

Excluding adjustments for previous years, taxation for the year at £496,000 was approximately £170,000 greater than in 1957. The percentage of tax in relation to profits will increase further in the current year and in subsequent years as the unredeemed balance of capital expenditure is reduced and as the interest payments made in respect of uranium loans progressively decrease in proportion to the repayment of the loans. In so far as can presently be determined, the company's liability for tax during the the year 1959 may be of the order of £600,000.

Operations : Gold Division

There was a further reduction in the tonnage milled and in the profit earned in the gold division compared with the previous year, this reduction in profit being more than compensated by the increase in profit from the uranium division. It is anticipated that the scale of operations and the profit earned in the gold division during 1959 will be of the same order as for the year 1958.

Gold ore, although still derived to a limited extent from the reclamation of such blocks and remnants as remain on the Main Reef horizon, is mainly derived from the stoping of the Kimberley Reefs at the North-east shaft in which area the major portion of the gold ore reserves is situated. During 1959 some development will be carried out on the Kimberley Reefs but the claim area still to be developed is small and under existing circumstances operations in the gold division are not expected to continue on a profitable basis for more than a few years.

Operations : Uranium Division

Members were informed in the Chairman's Statement for the year ended December 31, 1957, that the development programme was proceeding according to plan, that additional stope faces were becoming available and that the rate of milling would increase during 1958. The scale of operations and the production of uranium were in fact increased appreciably during the first half of the year under review, reaching a peak in July when 175,000 tons were milled and the full capacity of the treatment plant was employed.

In May, 1958, however, the Combined Development Agency imposed a limit on the total tonnage of uranium which it was prepared to purchase in any one year from the Atomic Energy Board of South Africa, and a quota of maximum production was set in respect of each uranium treatment plant. These quotas came into effect on July 1, 1958. Details of the arrangements as they affect this company are given in the Directors' Report.

The production capacity of the mine which had been built up over preceding years was in excess of the quota allocated to this company's plant, and it was therefore necessary during the second half of the year to reduce the rate of milling to conform with the production required under the new arrangements. The imposition of the quota, which will operate throughout the remaining period of the company's contract with the Atomic Energy Board, has thus already affected operations and has inhibited the expansion of production which had been planned in previous years and achieved immediately prior to the application of the quota arrangements, an expansion which would have resulted in increased profits. Under the present arrangements of restricted output, it is expected that the level of profits earned by the uranium division during 1959 will be of the same order as for the year 1958.

Owing to the recent relaxation of security provisions, it is now possible to disclose the price received for the company's uranium oxide and this information, together with the cost of production, is given in the Consulting Engineers' report attached to the Report and Accounts.

The cost of production per pound of uranium oxide is made up of :—

(a) the cost of mining and milling the ore and the cost of recovering the gold therein, equivalent to 80s. 8d. per lb.;

(b) plus the cost of recovering the uranium, equivalent to 10s. 6d. per lb.;

(c) less the revenue amounting to 17s. 11d. per lb. received from sundry sources and from the gold and silver recovered from the uranium ore.

The net cost is thus 73s. 3d. per lb. and it should be noted that this figure does **not** include any charges in respect of the repayment of or interest on loans raised for the uranium project.

The attention of members is drawn to the fact that, although this cost of 73s. 3d. per lb. of uranium oxide sold brings this company into the bracket of high-cost producers, there are two main factors which should be taken into account in attempting to assess the competitive position of the company as a uranium producer after the expiry of its present contract with the Combined Development Agency. These factors are (a) the cost of mining, and (b) grade.

(a) The Cost of Mining :

When in 1954 the operations of your company were transferred from the production of gold to the production of uranium, it was necessary to establish what was virtually a new mine on the Bird Reef Series. In order to reduce capital expenditure to a minimum, only one new shaft was sunk, as it was considered that the quickest and cheapest method of opening up the Bird Reef mine and of exploiting these reefs was to provide connections by underground development to five shafts sunk and used originally for the exploitation of other reefs and now used for the mining of Bird Reefs. This development programme has been an added burden on working costs.

Furthermore, the Bird Reefs in the upper levels of the mine dip steeply and are heavily faulted, factors which have added appreciably to the stoping costs. The reefs gradually flatten out in depth and it is hoped that the incidence of faulting will also decrease. The improved conditions anticipated in the lower levels of the mine should in due course have a beneficial effect on working costs per ton mined.

(b) The Grade :

The majority of South African uranium producers are primarily gold producers whose mining policy is dictated by the requirements of gold production. The uranium grade of the ore mined is therefore not the subject of conscious control but is determined simply by the quantity of uranium which happens to occur in the ore mined for gold. This company, on the other hand, is a primary producer and its mining policy is directed towards the production of uranium with gold as a by-product. Having regard to the current milling rate of nearly two million tons per annum, the uranium grade of the ore mined is maintained at the highest level compatible with ore reserves and that milling rate.

In the post-contract period it will probably be possible by milling at a lower rate and by selective mining of the then remaining ore reserves, to increase the grade of the ore milled in respect of both its uranium and gold, should this be necessary. In the light of present conditions, I consider that, in the terms of such a programme and having regard to the possible reduction in mining costs, the cost of producing uranium at your company's mine can then be brought within the range of what appear at the present time to be competitive world prices. It is, however, not possible at this stage to forecast what world prices for uranium will in fact be at the end of 1964 when your company's contract expires.

Development work during the year revealed satisfactory values on the Bird Reefs and there was a small increase in ore reserves. The footage accomplished again increased, the figures for the last four years being :

1955	83,192 feet
1956	97,799 feet
1957	122,563 feet
1958	134,348 feet

It is anticipated that development footage accomplished during the current year will be of the same order as in 1958.

Pneumoconiosis

The annual levy paid into the Controlled Mines' Compensation Fund during the year ended March 31, 1959, by Group "A" controlled mines, amounted to £2,467,500. The levy for the current year has been fixed by the Pneumoconiosis Board at a net amount of £800,000. This substantial reduction in the levy is due in the main to a decrease in the number of new cases of pneumoconiosis and tuberculosis occurring amongst mine em-

ployees. Moreover, it is expected that this liability will be reduced further because of a surplus existing in the Controlled Mines' Compensation Fund as disclosed in a recent valuation of the Fund carried out in terms of the Pneumoconiosis Act.

This company's contribution towards the annual levy for the year ended March 31, 1959, was £152,638, which amount was charged to working costs.

In conclusion, I would like to place on record the Board's appreciation of the able and willing services rendered by the General Manager, Mr. G. W. Holl, and employees on the mine and the technical and secretarial staffs at the Head Office.

April 28, 1959.

Coming Events

The Geological Mining and Metallurgical Society of India is to organize a symposium on the main ferrous metals, such as iron and manganese ore. The symposium, which is to be held in November, 1959, is expected to present a clear picture of India's position with regard to her iron and manganese ore deposits, and their immediate development and future prospects.

★

The first comprehensive all-British exhibition ever to be staged in the United States will take place in the Coliseum Building, New York City, from June 10 to June 26, 1960. The exhibition has the full backing of the British Government, the Dollar Exports Council, and the British-American Chamber of Commerce in New York. It is organized by the Federation of British Industries through its subsidiary, British Overseas Fairs Ltd.

★

The 121st annual meeting of the British Association for the Advancement of Science is to be held in York from September 2 to 9, 1959, under the presidency of Sir James Gray, C.B.E., M.C., F.R.S., Professor of Zoology in the University of Cambridge.

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Representatives of documentary and scientific film organizations from many countries will meet at the thirteenth Congress of the International Scientific Film Association, to be held in London and Oxford from September 23 to October 2, 1959.

★

The next meeting of the North-Western Fuel Luncheon Club is to take place on May 6 in the Engineers' Club, Albert Square, Manchester 2. The member guest speaker will be Mr. W. C. Parker, and the subject of his talk will be "Fuel and Its Uses". Mr. Parker is Regional Director, Central Electricity Generating Board, North-West, Merseyside, and North Wales Region.

★

A special meeting of the Iron and Steel Institute is to take place on the North-East Coast from July 6 to July 10.

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The Cementation Group of Companies—international mining, civil and specialist engineers—is shortly to hold its first Group Management Conference in London and the provinces. A total of 100 senior executives from twelve countries, including Britain, will take part. The Conference will be held from May 4 to May 15, and its theme will be "The Role of Management in an Expanding Group."

THE RHODESIA BROKEN HILL DEVELOPMENT COMPANY LIMITED

(Incorporated in Northern Rhodesia)

INCREASED ORE RESERVES

The following are extracts from the review by **Mr. H. F. Oppenheimer,** the chairman, which has been circulated with the annual report and accounts.

During 1958 lead and zinc prices fell to their lowest levels since 1946. Lead fluctuated between £68 and £78 per ton and showed no improvement in December, 1958 over the previous January; zinc prices varied from £61 to £78 per ton but finished the year fairly strongly at around £74 in December as against £62 in January, 1958.

Lead and Zinc Market

While the low level of prices was directly attributable to over-production in relation to the overall demand, consumption in Europe was maintained at a fairly good level and the market recession arose directly from developments in the United States of America.

There have been no significant changes in the market prices of lead and zinc since the end of the year, but it is interesting to note that the zinc price shows a firmer tone than the lead price and that the long-standing differential in favour of lead was reversed in November, since when zinc has frequently commanded £5 per ton more than lead.

It is difficult to make any prediction about the prices of lead and zinc during 1959. Some governmental decision may be taken to cut production and there has been an improvement in the industrial tempo of the United States, but it does seem that world production of both metals will be fully able to meet expected consumption this year.

While our Company is naturally no less affected by the fall in prices than any other producer, we are fortunate that the bulk of our output is sold in Southern Africa and although our metal stocks at the year end were slightly higher than we would have liked, I do not anticipate that we will have any difficulty in disposing of these and current production in 1959.

The lower prices inevitably resulted in a sharp reduction of profits during 1958 which, after providing for taxation, were £591,000 as compared with £909,000 in 1957. Capital expenditure at the mine was restricted to the minimum required for immediate essential items and amounted to £272,000 compared with the sum of £400,000 which we had estimated would have to be spent. The bulk of the expenditure related to the completion of the Mita Hills Dam scheme and associated electrical power plant; this outlay amounting to £240,000 was financed largely by drawing the remaining £200,000 of the Broken Hill Municipality loan. While no appropriation was necessary to cover capital expenditure during 1958, it was estimated that £300,000 must be spent in 1959 and it was considered advisable to make some provision towards this by appropriating £100,000 this year.

We have been able to recommend a net final dividend of 6d. per stock unit which, together with the interim dividend of 3d., makes a total of 9d. net per unit for the year. In view of the depressed state of the lead and zinc market, I think this can be considered a satisfactory return.

During the year it was possible to effect a reduction of £122,000 in the value of stores held. This is an important contribution to our cash resources but, while I am hopeful that further reductions will be effected, it is unlikely that these will be material in the future.

Imperial Smelting Process

Last year I referred to the investigations being undertaken in search of better methods than those at present employed in dealing with the complex ores we have at Broken Hill and during the year these investigations and studies became concentrated on the use of the Imperial Smelting Process which is already in commercial operation by the Imperial Smelting Corporation at Avonmouth. Comprehensive trials on various mixtures of ores and intermediate products from our mine were carried out in the experimental units at Avonmouth with complete technical success. The Consulting Engineers are following up these tests with a thorough economic assessment as this type of furnace seems to offer the most satisfactory answer to the problem of improving the recovery of lead and zinc from currently mined ores and of the treatment of the growing stocks of high-grade oxidized products which are not amenable to present processes. The Imperial Smelting Process, which produces simultaneously but separately zinc metal of Prime Western grade and lead bullion, is designed to give high recoveries of both metals at reasonable costs. It is also thought that, apart from being able to assimilate accumulated oxide ores, it would be possible to reclaim metal from slag dumps and the scale of operations at the mine and the output of metals could be increased.

Increased Ore Reserves

The capital expenditure required for the installation of an Imperial Smelting furnace and ancillary plant is under examination and I cannot give a figure at present. It is, however, likely to be very substantial and therefore, apart from a thorough assessment of the installation itself, the Consulting Engineers decided during the year to carry out an intensive programme of underground drilling in the mine so that further information could be obtained on the ore available. As a result an additional 386,400 tons of ore have been transferred from the indicated reserves to proved reserves and 583,300 tons of ore have been added to the indicated reserves. Although it was decided, as no work had been done at No. 2 Kopje for some years, to delete any tonnage previously allotted to this area, the total ore reserves at the end of the year were 5,145,300 tons averaging 28.6 per cent. zinc and 15.32 per cent. lead, compared with 4,387,100 tons at the end of last year, an increase of some 758,000 tons. Further work being undertaken at the mine is likely to reveal additional tonnages, and the No. 2 Kopje deposit is being re-examined and will be drilled before any tonnage from this source is again included in the ore reserves.

This very satisfactory increase in the ore reserves gives an estimated life at

the present rate of milling and extraction of about 25 years. As the Imperial Smelting Process will give a higher rate of recovery but will not shorten the working life of the mine, the Consulting Engineers' preliminary view that the installation of this type of process at the mine is probably an economic project is reinforced. We now have to await the full appraisal from them, which, if favourable, will have to be followed up by consideration of the best means of providing the substantial amount which will be required.

Even if the new process is introduced it is proposed to continue to produce electrolytic zinc from zinc concentrates in the existing plant, to which a second roaster is to be added by 1960 to enable a greater amount of zinc concentrates to be treated.

UNION CORPORATION, LIMITED

(Incorporated in the Union of South Africa)

ABRIDGED REPORT OF THE DIRECTORS FOR YEAR 1958

After providing for taxation and for outside shareholders' interest in profits of subsidiary companies, the consolidated net profit for the year was £1,903,957 (compared with £1,578,431 in 1957). To this has to be added £845,888 brought forward from 1957, making a total of £2,749,845. From the amount available for appropriation by subsidiary companies, £150,000 has been placed to General Reserve Accounts, £60,000 to Exploration Reserve Accounts and £766,302 carried forward as unappropriated profits, leaving £1,773,543 available for appropriation by the Corporation. The Directors have written off Note issue expenses amounting to £32,802, have placed £350,000 to the credit of Exploration Reserve Account and have declared a final dividend of 2s. 0d. United Kingdom currency per share less United Kingdom Income Tax, making, with the interim dividend of 1s. 0d. per share less United Kingdom Income Tax paid on 28th November last, a total dividend for the year of 3s. 0d. per share less United Kingdom Income Tax (the same as last year). These dividends absorbed £802,125. From the balance of £588,616 remaining the Directors have declared a bonus dividend of 6d. United Kingdom currency per share less United Kingdom Income Tax, absorbing £133,687. After adding in the unappropriated profits of subsidiary companies and parent company dividends receivable within the Group, there is a consolidated balance to be carried forward of £1,291,593. An increase in the final dividend in respect of the year would have entailed an additional United Kingdom profits tax liability. Accordingly the Directors have declared a bonus dividend not related to any specific period.

Holdings of shares, debentures and other securities have been taken into the Accounts at cost or under, but in no case above the market value of 31st December last, or, where no market price exists, above the Directors' valuation. The Directors, as on other occasions, have thought it expedient to write down the book cost of certain holdings below both cost and market price to allow for the wasting nature of a substantial part of the portfolio. To this end they have charged the Profit and Loss Account with £150,000, of which £50,000 has been charged in the Accounts of a subsidiary company.

During the year arrangements were made to provide additional finance for the Corporation's business (including the further exploitation of the Kinross goldfield) by placing privately in the Union of South Africa £2,000,000 of 6½% Registered Unsecured Notes at par repayable in instalments 1974/83. The money is being made available in eight equal quarterly amounts, the first of which was received on 31st March, 1958. Thus at 31st December the Corporation had issued £1,000,000 of these Notes.

The Directors record with profound regret the death on 8th August, 1958, of The Rt. Hon. The Viscount Bracken. Sir Charles J. Hambro, K.B.E., M.C., was elected Chairman in succession to Viscount Bracken and Mr. T. P. Stratten was elected Deputy Chairman, retaining the appointment of Managing Director and remaining resident in the Union of South Africa.

The Report includes the usual tables of gold statistics and the Corporation's Annual Trade Cycles Chart, revised to date.

GOLD MINING INTERESTS

The following table summarises the results for the past year of Companies operating in the Transvaal and Orange Free State in which the Corporation is largely concerned :—

	East Geduld Mines, Limited	*Geduld Proprietary Mines, Limited*	*The Grootvlei Proprietary Mines, Limited*	*Marievale Consolidated Mines, Limited*	*St. Helena Gold Mines, Limited*	*Van Dyk Consolidated Mines, Limited*
Tons Milled	1,547,000	929,000	2,360,000	891,000	1,468,000	913,000
Yield per ton, dwt.	6.15	3.31	4.25	5.22	5.85	3.68
Working Costs per ton	34s. 7d.	38s. 4d.	31s. 5d.	41s. 5d.	41s. 10d.	39s. 7d.
Working Profit per ton	42s. 7d.	3s. 3d.	21s. 11d.	24s. 1d.	31s. 6d.	6s. 7d.
Total Working Profit	£3,296,000	£152,000	£2,585,000	£1,073,000	£2,310,000	£300,000
Net Profit	£1,668,000	£843,000	£1,323,000	£623,000	£2,275,000	£357,000
Dividends : Total	£1,650,000	£822,000	£1,335,000	£563,000	£1,003,000	*
Per Stock Unit or Share	3s. 8d.	11s. 3d.	2s. 4d.	2s. 6d.	2s. 1d.	*

* Return of capital in 1958 £346,000, or 1s. 3d. per share.

The net profit figures include revenue from other sources. Thus East Geduld Mines' dividend income in 1958 on its stockholding in The Grootvlei Proprietary Mines was £62,720 and Geduld Proprietary Mines' dividend income in 1958 on its stockholdings in East Geduld Mines and The Grootvlei Proprietary Mines was £648,358.

ST. HELENA GOLD MINES.—At No. 2 shaft excellent progress has been made with development and preparation of stopes. In order to provide ventilation for the mining of an up-thrown block of reef on the eastern side of the property adjacent to the boundary with President Brand Gold Mining Company, which will be mined from No. 2 shaft, a ventilation shaft (known as No. 7 shaft) is being sunk to an initial depth of 4,100 ft. At the year-end it had reached a depth of 40 ft. In March of this year a dividend of 1s. 3d. per share was declared.

WINKELHAAK MINES.—The small vertical shaft (No. 3B) situated 350 ft. north of No. 3 shaft was completed at a depth of 1,471 ft. and brought into operation, greatly assisting the servicing of the No. 3 shaft area. Trial crushing started in March 1958 and was continued until the end of November, when full scale milling commenced. In December the Company earned a maiden monthly profit of £15,502.

Interests in Gold Mining Companies not under the administration of the Corporation.

STILFONTEIN GOLD MINING COMPANY.—There was a further increase in the combined profits from the production of gold and uranium during the year and two dividends totalling 3s. 9d. per share were declared.

WESTERN HOLDINGS.—There were increases in the average yield and in the tonnage of ore milled during the year ended 30th September, 1958, and, in consequence, the working profit increased substantially to £4,708,288. Two dividends, totalling 7s. 0d. per share, were declared and a further dividend of 3s. 6d. per share was declared in March of this year.

OTHER MINING INTERESTS

SAN FRANCISCO MINES OF MEXICO.—The reduced tonnages of metals sold and the lower prices obtained for them resulted in a fall in gross revenue from the sale of the Company's products from £10,068,000 to £6,416,000. After charging taxation amounting to £1,456,000, all but £38,000 being Mexican export, production and mercantile taxes assessed on gross value of metals sold, the Company made a net loss for the year of £208,000.

CHROME MINES OF SOUTH AFRICA.—The trading results for the year ended 30th June, 1958 showed a slight improvement over those for the previous year and the Company declared a dividend of 1s. 0d. per share in September last. The improved results were achieved in spite of a softening in the market for chrome ores as the Company had orders on hand at satisfactory prices. The market remains weak, however, and it is likely that the results for the current year will show some decline in profits.

The Corporation is also interested, *inter alia*, in the following Companies :—

SELECTION TRUST.—This Company paid a final dividend of 5s. 3d. per Ordinary Stock Unit for the year ended March 1958 and has since declared an interim dividend of 1s. 9d. per Unit for the year ended March 1959.

TSUMEB CORPORATION.—Due to a decline in non-ferrous metal prices on world markets, the net profit for the year ended 30th June, 1958, was £4,226,029 as compared with £7,012, 875 for the previous year, and dividends totalling 17s. 6d. per share were declared. During the first nine months of the current financial year the Company has declared dividends totalling 17s. 6d. per share.

OTHER INTERESTS

BAY HALL TRUST.—The net profit for 1958 was £138,961, compared with £136,244 in the previous year. The Company paid a dividend of 17½%, less tax, the same as for last year, plus a bonus dividend of 1½% less tax. At market prices on 31st December, 1958 (or where no market price existed, at valuations by the Directors on that day) the investments had an aggregate value of £3,848,628, as compared with their book value of £2,017,151.

SOUTH AFRICAN PULP & PAPER INDUSTRIES.—The net profit for the year ended 31st December, 1958, was £492,070, compared with £486,835 for the previous year A dividend of 2s. 0d. per share has been declared. At the Tugela mill the new M.G. paper machine was commissioned during the year. The Company is embarking on a project for the production of newsprint at the Enstra mill at an estimated cost of £2.700.000 of which £1,500,000 will be covered by a fixed interest-bearing loan, £275,625 by a small issue of shares and the balance will be drawn from the Company's own resources.

EXPLORATION

KINROSS AREA.—Drilling was continued during the year. It is intended shortly to make application to the Mining Leases Board of the Government of the Union of South Africa for two new mining leases. A further possible lease area is still under investigation and more drilling in this area will be undertaken.

Copies of the full Report and Accounts can be obtained on application at the London Office, Princes House, 95, Gresham Street, London, E.C.2.

THE BRITISH PETROLEUM COMPANY

RECORD GROUP SALES

The 50th Annual General Meeting of The British Petroleum Company Limited will be held on May 21 in London.

The following is an extract from the Statement by the Chairman, **Sir Neville Gass, K.B.E., M.C.,** which has been circulated to Stockholders:

For the year 1958 the Group sales amounted to 62 million tons, the highest yet recorded and nine million tons more than for 1956 or 1957. It should be borne in mind that in 1957 expansion was arrested by the effects of Suez, and accordingly the large increase in 1958 should be regarded as related to a two-year period rather than indicative of a single year's expansion.

Despite the increase in tonnage in 1958, the Group net sales figure of £598 million shows an increase of only £2 million on that for 1957 by reason of the lower prices ruling in 1958. The difficult trading conditions already being encountered at the beginning of the year, as reported in last year's statement, continued without relief through 1958. The Group income before taxation is up by £11 million, this higher increase being mainly due to the relief from certain exceptional expenses incurred in 1957, as mentioned last year.

Our supplies in 1958 were drawn almost wholly from our own sources, including over 60 million tons of crude oil from producing countries in the Middle East. Supplies from these countries are obtained under agreements which provide for profit sharing on the fifty-fifty principle. In total the sums included in the 1958 accounts for payment to these countries under fifty-fifty amount to £119 million. The comparison between this figure and the net income for the Group —£63 million—is instructive. The figures show that the fifty-fifty principle, and the manner in which it is applied, serve the producing countries well.

Production and Refining

In 1958 our main sources of crude oil were again Iran, Iraq, Kuwait, and Qatar, from which we obtained 60,700,000 tons, 12,000,000 tons more than in 1957, when the dislocations had resulted in a reduction of 1,000,000 tons compared with 1956.

In 1958 our total refinery throughput was just under 38,000,000 tons, some 6,000,000 more than in 1957. It has to be remembered, however, that the BP Group refinery throughputs in 1957 were adversely affected by the dislocations of that year.

Petroleum Chemicals: In the United Kingdom, BP participates in three companies whose plants are adjacent to our Grangemouth Refinery. As a result of steadily expanding manufacture of chemicals from petroleum, competition is becoming severe, but all these companies have had a successful year. In the last quarter of 1958 demand showed a definite upturn and all plants were operated at very satisfactory rates.

Distribution and Sales

During 1958 Western Hemisphere product prices at main export centres showed a general downward trend except for middle distillates which, due to severe winter conditions, were subject to an upsurge in demand and consequently a rise in price later in the year. At main export centres in the East, product prices, apart from fuel oil, showed little change throughout the year. In both West and East, the greatest reductions were in heavy fuel oil. Selling prices in the consumer markets were affected also by the lower levels of freight.

Vigorous competition was met in all our marketing areas and in some countries this was accentuated by supplies from Russian sources. In general our marketing associates were successful in holding their position, but in some areas under competitive pressure prices fell to unsatisfactory levels.

In the United Kingdom consumption was 24 per cent above the 1957 figure, which had been curtailed by rationing, and 20 per cent above the 1956 figure.

Despite severe competition and the continued recession in world shipping movements, sales of the BP International Oil Bunkering Service reached a higher level than ever before.

Our International Aviation Service, renamed AIR BP, has continued to increase its sales of aviation fuels.

All sections of the lubricants market expanded. Sales of BP Energol Visco-Static motor oil showed an increase of some 40 per cent over 1957. A new petrol/oil mixture for two-stroke engines sold under the name of BP Zoom was successfully put on the market. Our bitumen sales showed an improvement.

Our research and development activities continue to broaden in scope and to receive the emphasis that this important side of our operations merits.

Personnel

In this 50th year of the Company's history, it gives me very great pleasure to record a warm tribute to all our past and present employees, by whose work, enthusiasm and loyalty, the Company has grown and developed from a mere handful of pioneers in 1909 to a world-wide organization which now employs in the United Kingdom, afloat and overseas, directly and in our many subsidiary and associated companies, over 100,000 people. It is these men and women and their predecessors who have played the major part in building up a great enterprise and making the BP Group what it is today.

WORKSHOP MANAGER required for Central Colliery Workshop of British-managed organization in India. Experience in machine tools, foundry and electrical repairs required. Free passages, including family, free medical treatment provided; generous leave terms. Salary according to experience and qualifications. Please write to Box No. 2489, c/o Charles Barker and Sons Ltd., Gateway House, London, E.C.4.

ENGINEER required to supervise a group of collieries under British management in India. Electrical and Mechanical experience essential. Apply, giving full details of technical qualifications and practical experience. Free passages, including family, and free medical treatment provided; generous leave terms. Salary according to experience and qualifications. Please write to Box No. 2490, c/o Charles Barker and Sons Ltd., Gateway House, London, E.C.4.

MINING GEOLOGIST
Minimum five years' experience in pre-Cambrian areas, required for 18 months in Portuguese Angola. Geophysical experience desirable. Send résumé in confidence to Box No. 636, *The Mining Journal Ltd.*, 15 Wilson Street, Moorgate, London, E.C.2.

AUSTRALIA
THE UNIVERSITY OF NEW SOUTH WALES
VACANCY FOR PROFESSOR OF MINING ENGINEERING

The University invites applications for appointment to a newly created Chair of Mining Engineering in the School of Mining Engineering and Applied Geology.

Salary will be £A3,763 per annum.

The successful applicant will be expected to assist the Head of the School, Professor D. W. Phillips, in the administration of the School, and to promote teaching and research in the metalliferous mining section.

The University offers a four years' course leading to the degree of Bachelor of Engineering (Mining), and facilities are available for post-graduate work.

Applicants must be of high academic standing in the field of metalliferous mining and should possess a Mine Manager's Certificate and have experience in a responsible position in the metalliferous mining industry. Previous research experience in some aspect of metalliferous mining is desirable.

Subject to the consent of the Council of the University, professors may engage in a limited amount of higher consultative work.

Subject to satisfactory medical examination, professors will be eligible to join the Superannuation Fund, which provides a pension of £A1,638 per annum.

Professors are eligible for six months' study leave on full salary after three years of service, or twelve months after six years of service.

The University reserves the right to fill the Chair by invitation.

With the approval of the University and its bankers, married men may be assisted by loans to purchase a home.

First-class ship fare to Sydney of appointee and his family will be paid.

Four copies of applications, including the names of three referees and a recent photograph of the applicant, should be lodged with the Agent-General for New South Wales, 56 Strand, London, W.C.2, and a copy of the application should be forwarded by air mail in an envelope marked "University Appointment" to the Bursar, the University of New South Wales, Box 1, Post Office, Kensington, New South Wales, Australia, not later than May 31, 1959.

H/E 300 P.A. TRACTOR DRILLMASTER

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On right is the Hands-England Drillmaster 300 P.A. Rotary Drill mounted on a Fordson Major Industrial Tractor. This design provides great manoeuvrability and is intended primarily to enable the H/E Drillmaster 300 P.A. Rotary Drill to be used for Quarry and Open Cast blast hole, shot hole, auger, core or sample drilling, and although ideal for this, it is equally applicable to some difficult "off the road" locations, such as may be encountered during seismic exploration or shot hole drilling. Standard equipment provides for drilling holes of 2¾" to 4" in diameter or to ream out 2¾" diameter holes to larger sizes. Extra equipment can be supplied for cutting larger holes up to 5¼" diameter. For flushing cuttings to the surface an air compressor can be mounted directly on to the H/E Tractor Drillmaster and driven by the Tractor Engine. The compressor can achieve an up-hole annular velocity of 3,000 ft. per min.—using 'B' rod and 3" dia. bits. If air drilling is to be employed for larger holes, or where mud circulation is necessary, the equipment for these operations must be mounted on a separate trailer or tractor.

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The illustration on right shows the H/E Tractor Drillmaster during drilling operations in a quarry.

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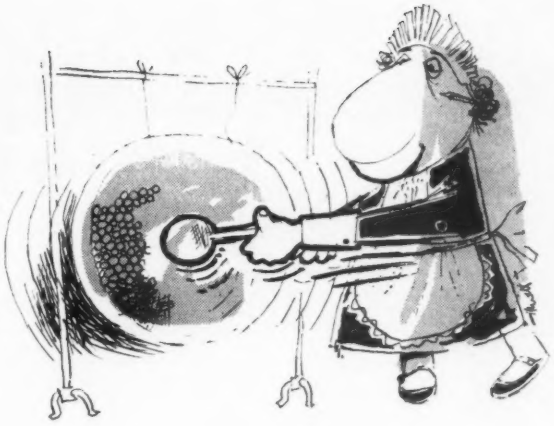

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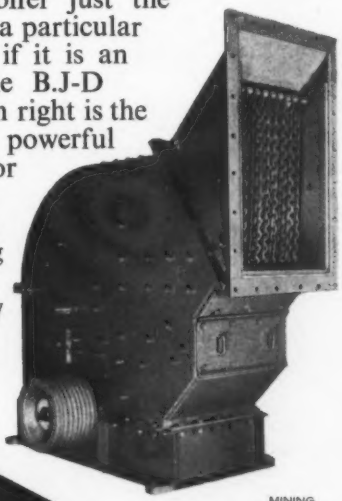

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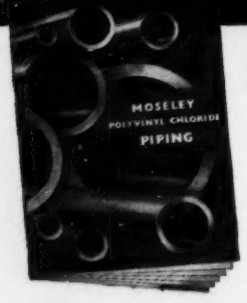

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International Mineral Processing Congress, 1960

An International Congress on Mineral Processing, organized by the Institution of Mining and Metallurgy, is to be held at Church House, Westminster, London, from April 6 to April 9, 1960. The scope of the Congress is of fundamental and applied research and development in the fields of mineral dressing and chemical processing, excluding smelting.

The Congress will be the fifth in the series of international gatherings held to discuss mineral processing problems. These gatherings began with a meeting in London in 1952, and since that date meetings have included similar sessions in France (1953), Germany (1955), and Sweden (1957).

In so far as the 1960 gathering is concerned, Dr. I. W. Wark, chief of the Division of Industrial Chemistry, Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia, has accepted an invitation to deliver a Sir Julius Wernher Memorial Lecture on the evening preceding the official opening of the Congress. Specialists from many countries have already offered papers, and as many as possible of these will be submitted for discussion in accordance with the following preliminary programme.

Wednesday, April 6, registration and reception, Memorial lecture; Thursday, April 7, official opening, beginning of sessions. Provisional sessions are: Thursday, April 7, morning, comminution and classification; afternoon, flotation research and practice; Friday, April 8, morning, gravity and dense medium separation, magnetic and electrical separation, sorting; afternoon, chemical processing, control and testing; Saturday, April 9, morning, process study, plant operation and layout. All Congress proceedings will be in French, German and English by simultaneous translation.

Plans are being made for members of the Congress to have the opportunity of visiting areas of the United Kingdom of particular industrial interest during the week following the Congress. It is also proposed to arrange a special programme for ladies in London during the Congress. All correspondence relating to the Congress should be addressed to the Secretary, the Institution of Mining and Metallurgy, 44 Portland Place, London, W.1, England.

Book Reviews

Mining Subsidence. *Published by the Institution of Civil Engineers. Price 5s. (members) and 10s. (non-members).*

A report on *Mining Subsidence* has been completed after more than six years' work by a committee of the Institution of Civil Engineers; chairman was Dr. W. K. Wallace, a past-president of the Institution. The committee was assisted by representatives of the British Transport Commission, Department of Scientific and Industrial Research, Institution of Municipal Engineers, Institution of Structural Engineers, Ministry of Housing and Local Government, etc., and the N.C.B.

The committee held its first meeting in January, 1953. Later, four sub-committees dealt separately with structures, bridges, roads, and public utilities. In each case, the subject was considered under five main headings: types and effects of movement, precautionary measures, remedial measures, and research.

Industrial Guide of the European Coal and Steel Community and its Ancillary Industries. *Published by C. L. Kruger, Dortmund. More than 1,200 pp. Price £6 19s.*

This volume lists in a neatly arranged form all the enterprises of the six participating countries, as well as other firms which are all connected with E.C.S.C., such as the iron producing or the mining undertakings on one hand, and the ancillary industries or customers on the other. The President of the High Authority in Luxemburg, Paul Finet, and the President of the Committee to the Common Market in Brussels, Walter Hallstein, have written messages of greeting, and the publishers have succeeded in editing this volume in four languages, English, French, German, and Italian.

The Geology of the Midlothian Coalfield. *Published by Her Majesty's Stationery Office. Price £1 1s. net.*

The greater part of the Midlothian Coalfield is shown on Sheet 32 of the 1 in. geological map of Scotland, which was issued in 1859. The second edition of Sheet 32 appeared in 1892 following a revision. The third edition of the sheet is dated 1910. A small area at the southern end of the coalfield was re-mapped between 1925 and 1928, but the main task of re-mapping was undertaken in 1947 and continued until 1952. Much new information has emerged as a result of the re-survey.